F.b. 7. 25

MIDWIFERY

VOL. II.

Pancreas

Stomach

Int. Os Uteri

Bladder

Ext. Os Uteri

Urethra

Coeliac A.

Sup. Mesent A

V. Portæ

Left Ren V

Desc. Aorta

Duodenum

Placenta

Left Iliac V

Int. Os Uteri

Rectum

Ext. Os Uteri

Rectum

Liquor Amnii

Section of a frozen body at the termination of the first stage of labour. (after Braune)
The bag of membranes is still unbroken, the cervix is fully dilated, and the head
(in the second position) is in the pelvic cavity.

A TREATISE

ON

THE SCIENCE AND PRACTICE

OF

MIDWIFERY

BY

W. S. PLAYFAIR, M.D., LL.D., F.R.C.P.

PHYSICIAN-ACCOUCHEUR TO H. I. AND R. H. THE DUCHESS OF EDINBURGH; PROFESSOR OF OBSTETRIC
MEDICINE IN KING'S COLLEGE; PHYSICIAN FOR THE DISEASES OF WOMEN AND CHILDREN TO
KING'S COLLEGE HOSPITAL; CONSULTING PHYSICIAN TO THE GENERAL LYING-IN
HOSPITAL, AND TO THE EVELINA HOSPITAL FOR CHILDREN; LATE
PRESIDENT OF THE OBSTETRICAL SOCIETY OF LONDON; EXAMINER
IN MIDWIFERY TO THE UNIVERSITY OF LONDON AND
TO THE ROYAL COLLEGE OF PHYSICIANS

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THE SCIENCE AND PRACTICE

OF

MIDWIFERY.

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PART III.—(*continued*).

LABOUR--(continued).

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CHAPTER IX.

PROLONGED AND PRECIPITATE LABOURS.

AMONG the difficulties connected with parturition there are Dystocia none of more frequent occurrence, and none requiring more arising from de- thorough knowledge of the physiology and pathology of fective or labour, than those arising from deficient or irregular action of irregular action of the expulsive powers. The importance of studying this class the uterus. of labours will be seen when we consider the numerous and very diverse causes which produce them.

That the mere prolongation of labour is in itself a serious Evil thing, is becoming daily more and more an acknowledged effects of pro- axiom of midwifery practice ; and that this is so is evident longed when we contrast the statistical returns of such institutions labour. as the Rotunda Lying-in Hospital of late years, with those which were published some twenty or thirty years ago. It may be fairly assumed that the practice of the distinguished heads of that well-known school represents the most advanced and scientific opinion of the day. When we find that, less than thirty years ago, the forceps were not used more than once in 310 labours, while according to the report for 1873

the late Master applied them once in 8 labours, it is apparent
how great is the change which has taken place.

Causes of
prolonged
labour.
Labour may be prolonged from an immense number of
causes, the principal of which will require separate study.
Some depend simply on defective or irregular action of the
uterus ; others act by opposing the expulsion of the child,
as, for example, undue rigidity of the parturient passages,
tumours, bony deformity, and the like. Whatever the source
of delay, a train of formidable symptoms is developed, which
are fraught with peril both to the mother and the child. As

The symp-
toms vary
much in
different
cases.
regards the mother they vary much in degree, and in the
rapidity with which they become established. In many cases,
in which the action of the uterus is slight, it may be long
before serious results follow ; while in others, in which a
strongly-acting organ is exhausting itself in futile endeavours
to overcome an obstacle, the worse signs of protraction may
come on with comparative rapidity.

The influ-
ence of the
stage of
labour in
protrac-
tion.
The stage of labour in which delay occurs has a marked
effect in the production of untoward symptoms. It is a well-
established fact that prolongation is of comparatively small
consequence to either the mother or child in the first stage,
when the membranes are still intact, and when the soft
parts of the mother, as well as the body of the child, are
protected by the liquor amnii from injurious pressure ;
whereas if the membranes have ruptured, prolongation
becomes of the utmost importance to both as soon as the
head has entered the pelvis, when the uterus is strongly
excited by reflex stimulation, when the maternal soft parts
are exposed to continuous pressure, and when the tightly
contracted uterus presses firmly on the fœtus and obstructs
the placental circulation. It is in reference to the latter
class of cases that the change of practice, already alluded to,
has taken place, with the utmost beneficial results both to
mother and child.

It must not be assumed, however, that prolongation of
labour is never of any consequence until the second stage
has commenced. The fallacy of such an opinion was long
ago shown by Simpson, who proved in the most conclusive
way, that both the maternal and fœtal mortality were greatly
increased in proportion to the entire length of the labour ;
and all practical accoucheurs are familiar with cases in which

symptoms of gravity have arisen before the first stage is concluded. Still, relatively speaking, the opinion indicated is undoubtedly correct.

In the present chapter we have to do only with those causes of delay connected with the expulsive powers. Inasmuch, however, as the injurious effects of protraction are similar in kind, whatever be the cause, it will save needless repetition if we consider, once for all, the train of symptoms that arise whenever labour is unduly prolonged.

As long as the delay is in the first stage only, with rare exceptions, no symptoms of real gravity arise for a length of time; it may be even for days. There is often, however, a partial cessation of the pains, which, in consequence of temporary exhaustion of nervous force, may even entirely disappear for many consecutive hours. Under such circumstances, after a period of rest, either natural or produced by suitable sedatives, they recur with renewed vigour. *Delay in the first stage is rarely serious. Temporary cessation of the pains.*

A similar temporary cessation of the pains may often be observed after the head has passed through the os uteri, to be also followed by renewed vigorous action after rest. But now any such irregularity must be much more anxiously watched. In the majority of cases any marked alteration in the force and frequency of the pains at this period indicates a much more serious form of delay, which in no long time is accompanied by grave general symptoms. The pulse begins to rise, the skin to become hot and dry, the patient to be restless and irritable. The longer the delay, and the more violent the efforts of the uterus to overcome the obstacle, the more serious does the state of the patient become. The tongue is loaded with fur, and in the worst cases dry and black; nausea and vomiting often become marked; the vagina feels hot and dry, the ordinary abundant mucous secretion being absent; in severe cases it may be much swollen, and if the presenting part be firmly impacted, a slough may even form. Should the patient still remain undelivered, all these symptoms become greatly intensified; the vomiting is incessant, the pulse is rapid and almost imperceptible, low muttering delirium supervenes, and the patient eventually dies with all the worst indications of profound irritation and exhaustion. *Symptoms of protraction in the second stage.*

So formidable a train of symptoms, or even the slighter

Such symptoms should never be allowed to develop.

degrees of them, should never occur in the practice of the skilled obstetrician; and it is precisely because a more scientific knowledge of the process of parturition has taught the lesson that, under such circumstances, prevention is better than cure, that earlier interference has become so much more the rule.

Those who taught that nothing should be done until nature had had every possible chance of effecting delivery, and who, therefore, allowed their patients to drag on in many weary hours of labour, at the expense of great exhaustion to themselves, and imminent risk to their offspring, made much capital out of the time-honoured maxim that 'meddlesome midwifery is bad.' When this proverb is applied to restrain the rash interference of the ignorant, it is of undeniable value; but when it is quoted to prevent the scientific action of the experienced, who know precisely when and why to interfere, and who have acquired the indispensable mechanical skill, it is sadly misapplied.

State of the uterus in protracted labour.

The nature of the pains and the state of the uterus, in cases of protracted labour, are peculiarly worthy of study, and have been very clearly pointed out by Dr. Braxton Hicks.[1] He shows that, when the pains have apparently fallen off and become few and feeble, or have entirely ceased, the uterus is in a state of continuous or tonic contraction, and that the irritation resulting from this is the chief cause of the more marked symptoms of powerless labour. If, in a case of the kind, the uterus be examined by palpation, it will be found firmly contracted between the pains. The correctness of this observation is beyond question, and it will, no doubt, often be an important guide in treatment. Under such circumstances instrumental interference is imperatively demanded.

Conditions and causes affecting the expulsive powers.

In considering the causes of protracted labour, it will be well first to discuss those which affect the expulsive powers alone, leaving those depending on morbid states of the passages for future consideration; bearing in mind, however, that the results, as regards both the mother and the child, are identical, whatever may be the cause of delay.

Constitution of the patient.

The general constitutional state of the patient may materially influence the force and efficiency of the pains.

[1] *Obst. Trans.* vol. ix.

Thus it not unfrequently happens that they are feeble and ineffective in women of very weak constitution, or who are much exhausted by debilitating disease. Cazeaux pointed out that the effects of such general conditions are often more than counterbalanced by flaccidity and want of resistance of the tissues, so that there is less obstacle to the passage of the child. Thus in phthisical patients reduced to the last stage of exhaustion, labour is not unfrequently surprisingly easy.

Long residence in tropical climates causes uterine inertia, in consequence of the enfeebled nervous power it produces. *Influence of tropical climates.* It is a common observation that European residents in India are peculiarly apt to suffer from post-partum hæmorrhage from this cause. The general mode of life of patients has an unquestionable effect; and it is certain that deficient and *Mode of life.* irregular uterine action is more common in women of the higher ranks of society, who lead luxurious, enervating lives, than in women whose habits are of a more healthy character.

Tyler Smith lays much stress on frequent child-bearing as a cause of inertia, pointing out that a uterus which has *Frequent child-bearing.* been very frequently subjected to the changes connected with pregnancy, is unlikely to be in a typically normal condition. It is doubtful, however, whether the uterus of a perfectly healthy woman is affected in this way; certainly, if child-bearing had undermined her general health, the labours are likely to be modified also.

Age has a decided effect. In the very young the pains are apt to be irregular, on account of imperfect development *Age of patient.* of the uterine muscle. Labour taking place for the first time in women advanced in life is also apt to be tedious, but not by any means so invariably as is generally believed. The apprehensions of such patients are often agreeably falsified, and where delay does occur, it is probably more often referable to rigidity and toughness of the parturient passages than to feebleness of the pains.

Morbid states of the primæ viæ frequently cause irregular, painful, and feeble contractions. A loaded state of the rec- *Disorders of the intestines.* tum has a remarkable influence, as evidenced by the sudden and distinct change in the character of the labour which often follows the use of suitable remedies. Undue distension *Distended bladder.* of the bladder may act in the same way, more especially in the second stage. When the urine has been allowed to

accumulate unduly, the contraction of the accessory muscles of parturition often causes such intense suffering, by compressing the distended viscus, that the patient is absolutely unable to bear down. Hence the labour is carried on by uterine contractions alone, slowly, and at the expense of much suffering. A similar interference with the action of the accessory muscles is often produced by other causes. Bronchitis and other diseases co-existing with pregnancy. Thus if labour comes on when the patient is suffering from bronchitis or other chest disease, she may be quite unable to fix the chest by a deep inspiration, and the diaphragm and other accessory muscles cannot act. In the same way they may be prevented from acting when the abdomen is occupied by an ovarian tumour, or by ascitic fluid.

Mental conditions. Mental conditions have a very marked effect. This is so commonly observed that it is familiar to the merest beginner in midwifery practice. The fact that the pains often diminish temporarily on the entrance of the accoucheur is known to every nurse; and so also undue excitement, the presence of too many people in the room, overmuch talking, have often the same prejudicial effect. Depression of mind, as in unmarried women, and fear and despondency in women who have looked forward with apprehension to the labour, are also common causes of irregular and defective action.

Excessive amount of liquor amnii. Undue distension of the uterus from an excessive amount of liquor amnii not unfrequently retards the first stage, by preventing the uterus from contracting efficiently. When this exists, the pains are feeble and have little effect in dilating the cervix beyond a certain degree. This cause may be suspected when undue protraction of the first stage is associated with an unusually large size and marked fluctuation of the uterine tumour, through which the fœtal limbs cannot be made out on palpation. On vaginal examination, the lower segment of the uterus will be found to be very rounded and prominent, while the bag of membranes will not bulge through the os during the acme of the pain.

Malpositions of the uterus. A somewhat similar cause is undue obliquity of the uterus, which prevents the pains acting to the best mechanical advantage, and often retards the entry of the presenting part into the brim. The most common variety is anteversion, resulting from undue laxity of the abdominal parietes, which is especially found in women who have borne

many children. Sometimes that is so excessive that the
fundus lies over the pubes, and even projects downwards
towards the patient's knees. The consequence is that, when
labour sets in, unless corrective means be taken, the pains
force the head against the sacrum, instead of directing it into
the axis of the pelvic inlet. Another common deviation is
lateral obliquity, a certain degree of which exists in almost
all cases, but sometimes it occurs to an excessive degree.
Either of these states can readily be detected by palpation
and vaginal examination combined. In the former the os
may be so high up, and tilted so far backwards, that it may
be at first difficult to reach it at all.

Besides being feeble, the uterine contractions, especially *Irregular*
in the first stage, are often irregular and spasmodic, intensely *and spasmodic*
painful, but producing little or no effect on the progress of *pains.*
the labour. This kind of case has been already alluded to
in treating of the use of anæsthetics (vol. i. p. 354), and
is very common in highly nervous and emotional women of
the upper classes. Such irregular contractions do not ne-
cessarily depend on mental causes alone, and they often
follow conditions producing irritation, such as loaded bowels,
too early rupture of the membranes, and the like. Dr. Tren-
holme, of Montreal,[1] believes that such irregular pains most
frequently depend on abnormal adhesions between the decidua
and the uterine walls, which interfere with the proper dila-
tation of the os, and he has related some interesting cases in
support of this theory.

The mere enumeration of these various causes of pro- *Treat-*
tracted labour will indicate the treatment required. Some *ment.*
of them, such as the constitutional state of the patient, age,
or mental emotion, it is, of course, beyond the power of the
practitioner to influence or modify; but in every case of
feeble or irregular uterine action, a careful investigation
should be made with the view of seeing if any removable
cause exist. For example, the effect of a large enema, when *Of loaded*
we suspect the existence of a loaded rectum, is often very *bowels.*
remarkable; the pains frequently almost immediately chang-
ing in character, and a previously lingering labour being
rapidly terminated.

Excessive distension of the uterus can only be treated by

[1] *Obst. Trans.* 1873.

Of excessive distension of the uterus. artificial evacuation of the liquor amnii; and after this is done, the character of the pains often rapidly changes. This expedient is indeed often of considerable value in cases in which the cervix has dilated to a certain extent, but in which no further progress is made, especially if the bag of membranes does not protrude through the os during the pains, and the cervix itself is soft, and apparently readily dilatable. Under such circumstances, rupture of the membranes, even before the os is fully dilated, is often very useful.

Of adherent membranes. If we have reason to suspect morbid adhesions between the membranes and the uterine walls, an endeavour must be made to separate them by sweeping the finger or a flexible catheter round the internal margin of the os, or puncturing the sac. The former expedient has been advocated by Dr. Inglis,[1] as a means of increasing the pains when the first stage is very tedious, and I have often practised it with marked success. Trenholme's observation affords a rationale of its action. The manœuvre itself is easily accomplished, and, provided the os be not very high in the pelvis, does not give any pain or discomfort to the patient.

Of uterine deviations. Attention should always be paid to remedying any deviations of the uterus from its proper axis. If this be lateral, the proper course to pursue is to make the patient lie on the opposite side to that towards which the organ is pointing. In the more common anterior deviation she should lie on her back, so that the uterus may gravitate towards the spine, and a firm abdominal bandage should be applied. This prevents the organ from falling forwards, while its pressure stimulates the muscular fibres to increased action; hence it is often very serviceable when the pains are feeble, even if there be no anteversion.

Of temporary exhaustion. In a frequent class of cases, especially in the first stage, the pains diminish in force and frequency from fatigue, and the indication then is to give a temporary rest, after which they recommence with renewed vigour. Hence an opiate, such as 20 minims of Battley's solution, which often acts quickest when given in the form of enema, is frequently of the greatest possible value. If this secure a few hours' sleep the patient will generally awake much refreshed and invigorated. It is important to distinguish this variety of

[1] *Sydenham Society's Year-Book*, 1869.

arrested pain from that dependent on actual exhaustion ; and this can be done by attention to the general condition of the patient, and especially by observing that the uterus is soft and flaccid in the intervals between the pains, and that there is none of the tonic contraction, indicated by persistent hardness of the uterine parietes. When the pains are irregular, spasmodic, and excessively painful, without producing any real effect, opiates are also of great service : and it is under such circumstances that chloral is especially valuable.

Still a large number of cases will arise in which the absence of all removable causes has been ascertained, and in which the pains are feeble and ineffective. We must now proceed to discuss their management. The fault being the want of sufficient contraction, the first indication is to increase the force of the pains. Here the so-called *oxytocic* remedies come into action ; and, although a large number of these have been used from time to time, such as borax, cinnamon, quinine, and galvanism, practically, the only one in which reliance is generally placed is the ergot of rye. This has long been the favourite remedy for deficient uterine action, and it is a powerful stimulant of the uterine fibres. It has, however, very serious disadvantages, and it is very questionable whether the risks to both mother and child do not more than counterbalance any advantages attending its use. The ergot is given in doses of 15 or 20 grains of the freshly powdered drug infused in warm water, or in the more convenient form of the liquid extract in doses of from 20 to 30 minims, or still better, in the form of ergotine injected hypodermically, 3 to 4 minims of the hypodermic solution being used for the purpose. In about fifteen minutes after its administration the pains generally increase greatly in force and frequency, and if the head be low in the pelvis, and if the soft parts offer no resistance, the labour may be rapidly terminated.

Were its use always followed by this effect there would be little or no objection to its administration. The pains, however, are different from those of natural labour, being strong, persistent, and constant. Its effect, indeed, is to produce that very state of tonic and persistent uterine contraction which has already been pointed out as one of the chief

dangers of protracted labour. Hence, if from any cause the exhibition of the drug be *not* followed by rapid delivery, a condition is produced which is serious to the mother, and which is extremely perilous to the child, on account of the tonic contraction of the muscular fibres obstructing the utero-placental circulation. Dr. Hardy found that soon the fœtal pulsations fall to 100, and, if delivery be long delayed, they commence to intermit. He also observed that when this occurred the child was always born dead, and found that the number of still-born children after ergot has been exhibited was very large; for out of 30 cases in which he gave it in tedious labour, only 10 of the children were born alive. Nor is its use by any means free from danger to the mother; a not inconsiderable number of cases of rupture of the uterus have been attributed to its incautious use. Hence, if it is to be given at all, it is obvious that it must be with strict limitations, and after careful consideration. It is worthy of note that in the Rotunda Hospital in Dublin, the use of ergot as an oxytocic before delivery has been prohibited by the present Master.

Limitations to its use.

The cardinal point to remember is that it is absolutely contra-indicated unless the absence of all obstacles to rapid delivery has been ascertained. Hence, it is only allowable when the first stage is over, and the os fully dilated; when the experience of former labours has proved the pelvis to be of ample size; and when the perinæum is soft and dilatable. Perhaps, as has been suggested, the administration of small doses of from 5 to 10 minims of the liquid extract every ten minutes, until more energetic action set in, might obviate some of these risks.

Quinine as an oxytocic.

The use of quinine as an oxytocic deserves much more attention than it has generally received. I frequently employ it in lingering labour with marked benefit, and it does not seem to have any of the bad effects of ergot. According to the observations of Dr. Albert H. Smith, in 42 cases of parturition, it presented the following peculiar characteristics:—

It has no power in itself to excite uterine contractions, but simply acts as a general stimulant, and promoter of vital energy and functional activity.

In normal labour at full term, its administration in a dose

of fifteen grains is usually followed in as many minutes by a decided increase in the force and frequency of the uterine contractions, changing in some instances a tedious, exhausting labour into one of rapid energy, advancing to an early completion.

It promotes the permanent tonic contraction of the uterus, after the expulsion of the placenta ; women that had flooded in former labours escaping entirely, there not having been an instance of post-partum hæmorrhage in the whole 42 cases.

It also diminishes the lochial flow where it had been excessive in former labours, the change being remarked upon by the patients, and consequently lessens the severity of the after-pains.

Cinchonism is very rarely observed as an effect of large doses in parturient women.[1]

The faradic current applied on either side of the uterine tumour, midway between the anterior-superior spine of the ilium and the umbilicus, has recently been strongly recommended by Dr. Kilner,[2] not only as a means of increasing uterine action, but of alleviating the sufferings of childbirth. I have tried it in several cases, but am not satisfied as to its possessing the properties attributed to it. *Use of the faradic current.*

If we had no other means of increasing defective uterine contractions at our disposal, and if the choice lay only between the use of ergot and instrumental delivery, there might not be so much objection to a cautious use of the drug in suitable cases.   We have, however, a means of increasing the force of the uterine contractions so much more manageable, and so much more resembling the natural process, that I believe it to be destined to entirely supersede the administration of ergot.   This is the application of manual pressure to the uterus through the abdomen, an expedient that has of late years been much used in Germany, and has begun to be employed in English practice. I believe, therefore, that ergot should be chiefly used for the purpose of exciting uterine contraction after delivery, when its peculiar property of promoting tonic contraction is so valuable, and that it should rarely, if at all, be employed before the birth of the child. *Manual pressure as a means of increasing the uterine contractions.*

[1]   *Trans. Coll. Phys. Philad.* 1875, p. 183.
[2]   *Lancet,* January 1, 1881.

The systematic use of uterine pressure as an oxytocic was first prominently brought under the notice of the profession by Kristeller, under the name of 'Expressio Fœtus,' although it has been used in various forms from time immemorial. Albucasis, for example, was clearly acquainted with its use, and referred to it in the following terms : ' Cum ergo vides ista signa, tunc oportet, ut comprimatur uterus ejus ut descendat embryo velociter.' There are some curious obste-

Its use among various nations.

tric customs among various nations, which probably arose from a recognition of its value ; as, for example, the mode of delivery adopted among the Kalmucks, where the patient sits at the foot of the bed, while a woman seated behind her, seizes her round the waist and squeezes the uterus during the pains. Amongst the Japanese, Siamese, North American Indians, and many other nations, pressure, applied in various ways, is habitually used.

In some cases it is possible to expel the child entirely by pressure.

Kristeller maintains that it is possible to effect the complete expulsion of the child by properly applied pressure, even when the pains are entirely absent. Strange as this may appear to those who are not familiar with the effects of pressure, I believe that, under exceptional circumstances, when the pelvis is very capacious, and the soft parts offer but slight resistance, it can be done. I have delivered in this way a patient whose friends would not permit me to apply the forceps, when I could not recognise the existence of any uterine contraction at all, the fœtus being literally squeezed out of the uterus. It is not, however, as replacing absent

It is, however, as a means of intensifying feeble pains that pressure is valuable.

pains, but as a means of intensifying and prolonging the effects of deficient and feeble ones, that pressure finds its best application.

Its effects are often very remarkable, especially in women of slight build, where there is but little adipose tissue in the abdominal walls, and not much resistance in the pelvic tissues. If the finger be placed on the head while pressure is applied to the uterus, a very marked descent can readily be felt, and not infrequently two or three applications will force the head on to the perinæum. There are, however, certain conditions

Circumstances contra-indicating the use of pressure.

when it is inapplicable, and the existence of which should contra-indicate its use. Thus if the uterus seem unusually tender on pressure, and, *à fortiori*, if the tonic contraction of exhaustion be present, it is inadmissible. So also if there

be any obstruction to rapid delivery, either from narrowing of the pelvis or rigidity of the soft parts, it should not be used. The cases suitable for its application are those in which the head or breech is in the pelvic cavity, and the delay is simply due to a want of sufficiently strong expulsive action.

It may be applied in two ways. The better is to place the patient on her back at the edge of the bed, and spread the palms of the hands on either side of the fundus and body of the uterus, and, when a pain commences, to make firm pressure during its continuance downwards and backwards in the direction of the pelvic inlet. As the contraction passes off the pressure is relaxed, and again resumed when a fresh pain begins. In this way each pain is greatly intensified, and its effect on the progress of the foetus much increased. It is not essential that the patient should lie on her back. A useful, although not so great, amount of pressure can be applied when she is lying in the ordinary obstetric position on her left side, the left hand being spread out over the fundus, leaving the right free to watch the progress of the presenting part per vaginam.

Mode of application.

The special value of this method of treating ineffective pains is, that the amount and frequency of the pressure are completely within the control of the practitioner, and are capable of being regulated to a nicety in accordance with the requirements of each particular case. It has the peculiar advantage of closely imitating the natural means of delivery, and of being absolutely without risk to the child; nor is there any reason to think that it is capable of injuring the mother. At least I may safely say that, out of the large number of cases in which I have used it, I have never seen one in which I had the least reason to think that it had proved hurtful. Of course, it is essential not to use undue roughness; firm and even strong pressure may be employed, but that can be done without being rough; and, as its application is always intermittent, there is no time for it to inflict any injury on the uterine tissues.

Special value of uterine pressure.

Pressure is specially valuable when it is desirable to intensify feeble pains. It may be serviceably employed when the pains are altogether absent, to imitate and replace them, provided there be nothing but the absence of a *vis à tergo* to prevent speedy delivery. In such cases an endeavour

Pressure may also be used when the pains are altogether absent.

should be made to imitate the pains as closely as possible, by applying the pressure at intervals of four or five minutes, and entirely relaxing it after it has been applied for a few seconds.

Change of profession sional opinion as to instrumental delivery.

When all these means fail we have then left the resource of instrumental aid, and we have now to consider the indications for the use of the forceps under such circumstances. It has been already pointed out that professional opinion on this point has been undergoing a marked change; and that it is now recognised as an axiom by the most experienced teachers that, when we are once convinced that the natural efforts are failing, and are unlikely to effect delivery, except at the cost of long delay, it is far better to interfere soon rather than late, and thus prevent the occurrence of the serious symptoms accompanying protracted labour. The recent important debate on the use of the forceps at the Obstetrical Society of London remarkably illustrated these statements, for, while there was much difference of opinion as to the advisability of applying the forceps when the head was high in the pelvis, a class of cases not now under consideration, it was very generally admitted that the modern teaching was based on correct scientific grounds. This is, of course, directly opposed to the view so long taught in our standard works, in which instrumental interference was strictly prohibited unless all hope of natural delivery was at an end; and in which the commencement at least, if not the complete establishment, of symptoms of exhaustion, was considered to be the only justification for the application of the forceps in lingering labour.

Views of Dr. Johnston on the use of the forceps.

The reasons which have led the late distinguished Master of the Rotunda Hospital to a more frequent use of the forceps are so well expressed in his report for 1872, that I venture to quote them, as the best justification for a practice that many practitioners of the older school will, no doubt, be inclined to condemn as rash and hazardous. He says:[1] ' Our established rule is that so long as nature is able to effect its purpose without prejudice to the constitution of the patient, danger to the soft parts, or the life of the child, we are in duty bound to ·allow the labour to proceed; but as

[1] *Fourth Clinical Report of the Rotunda Lying-in Hospital for the year ending* 1872.

soon as we find the natural efforts are beginning to fail, and after having tried the milder means for relaxing the parts or stimulating the uterus to increased action, and the desired effects not being produced, we consider we are in duty bound to adopt still prompter measures, and by our timely assistance relieve the sufferer from her distress and her offspring from an imminent death.   Why, may I ask, should we permit a fellow-creature to undergo hours of torture when we have the means of relieving her within our reach ?   Why should she be allowed to waste her strength, and incur the risks consequent upon long pressure of the head on the soft parts, the tendency to inflammation and sloughing, or the danger of rupture, not to speak of the poisonous miasma which emanates from an inflammatory state of the passages, the result of tedious labour, and which is one of the fertile causes of puerperal fever and all its direful effects, attributed by some to the influence of being confined in a large maternity, and not to its proper source, *i.e.*, the labour being allowed to continue till inflammatory symptoms appear ?   The more we consider the benefits of timely interference, and the good results which follow it, the more are we induced to pursue the system we have adopted, and to inculcate to those we are instructing the advantages to be gained by such practice, both in saving the life of the child as well as securing the greater safety of the mother.'   It would be impossible to put the matter in a stronger or clearer light, and I feel confident that these views will be, endorsed by all who have adopted the more modern practice.

In the first edition of this work I used the statistics of Dr. Hamilton, of Falkirk, and other modern writers, as proving that a more frequent use of the forceps than had been customary diminished in a remarkable degree the infantile mortality.   Dr. Galabin [1] has recently published an admirable paper on this subject, in which, by a careful criticism of these figures, he has, I think, proved that the conclusions drawn from them are open to doubt, and that the saving of infantile life following more frequent forceps delivery is by no means so great as I had supposed.   Dr. Roper, in his remarks in the recent debate in the Obstetrical Society, brought forward some strong arguments in support of the

Effect of early interference on the infantile mortality.

[1] *Obstetrical Journal*, December, 1877.

same view. This, however, does not in any way touch the main points at issue referred to in the preceding paragraph.

It is, of course, right that we should consider the opposite point of view, and reflect on the disadvantages which may attend the interference advocated. Here I should point out that I am now talking only of the use of the forceps in simple inertia, when the head is low in the pelvic cavity, and when all that is wanted is a slight *vis à fronte* to supplement the deficient *vis à tergo*. The use of the instrument when the head is arrested high in the pelvis, or in cases of deformity, or before the os uteri is completely expanded, is an entirely different and much more serious matter, and does not enter into the present discussion. The chief question to decide is, if there be sufficient risk to the mother to counterbalance that of delay. It will, of course, be conceded by all that the forceps in the hands of a coarse, bungling, and ignorant practitioner, who has not studied the proper mode of operating, may easily inflict serious damage. The possibility of inflicting injury in this way should act as a warning to every obstetrician to make himself thoroughly acquainted with the proper mode of using the instrument, and to acquire the manual skill which practice and the study of the mechanism of delivery will alone give ; but it can hardly be used as an argument against its use. If that were admitted, surgical interference of any kind would be tabooed, since there is none that ignorance and incapacity might not render dangerous.

Assuming, therefore, that the practitioner is able to apply the forceps skilfully, is there any inherent danger in its use ? I think all who dispassionately consider the question must admit that, in the class of cases alluded to, the operation is so simple that its disadvantages cannot for a moment be weighed against those attending protraction and its consequences. Against this conclusion statistics may possibly be quoted, such as those of Churchill, who estimated that 1 in 20 mothers delivered by forceps in British practice were lost. But the fallacy of such figures is apparent on the slightest consideration ; and by no one has this been more conclusively shown than by Drs. Hicks and Phillips in their paper on tables of mortality after obstetric operations,[1]

[1] *Obst. Trans.* vol. xiii.

where it is proved in the clearest manner that such results are due not to the treatment, but rather to the fact that the treatment was so long delayed.

It is quite impossible to lay down any precise rule as to when the forceps should be used in uterine inertia. Each case must be treated on its own merits, and after a careful estimate of the effects of the pains. The rules generally taught were that the head should be allowed to rest at or near the perinæum for a number of hours, and that interference was contra-indicated if the slightest progress were being made. It is needless to say that both of these rules are incompatible with the views I have been inculcating, and that any rule based upon the length of time the second stage of labour has lasted must necessarily be misleading. What has to be done, I conceive, is to watch the progress of the case anxiously after the second stage has fairly commenced, and to be guided by an estimate of the advance that is being made and the character of the pains, bearing in mind that the risk to the mother, and still more to the child, increases seriously with each hour that elapses. If we find the progress slow and unsatisfactory, the pains flagging and insufficient, and incapable of being intensified by the means indicated, then, provided the head be low in the pelvis, it is better to assist at once by the forceps, rather than to wait until we are driven to do so by the state of the patient.[1]

Impossibility of laying down any definite rules for use of the forceps.

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[1] It may, perhaps, be of interest in connection with this important topic in practical midwifery if I reprint a letter I published some years ago in the *Medical Times and Gazette*. An historical case, such as that of which it treats, will better illustrate the evil effects that may follow unnecessary delay than any amount of argument. It seems to me impossible to read the details of the delivery it describes without being forcibly struck with the disastrous results which followed the practice adopted, which, however, was strictly in accordance with that considered correct, up to a quite recent date, by the highest obstetric authorities.

ON THE DEATH OF THE PRINCESS CHARLOTTE OF WALES.

(To the Editor of the *Medical Times and Gazette*.)

SIR,—The letter of your correspondent, 'An Old Accoucheur,' regarding the death of the Princess Charlotte, raises a question of great interest—viz. whether the fatal result might have been averted under other treatment ? The history of the case is most instructive, and I think a careful consideration of it leaves little room to doubt that, though the management of the labour was quite in accordance with the teaching of the day, it was entirely

Precipi-
tate labour
less com-
mon than
lingering.

Undue rapidity of labour is certainly more uncommon than its converse, but still it is by no means of unfrequent

opposed to that of modern obstetric science. The following account of the labour may interest your readers, and will probably be new to most of them. It is contained in a letter from Dr. John Sims to the late Dr. Joseph Clarke, of Dublin :—

'London : November 15, 1817.

'My dear Sir,—I do not wonder at your wishing to have a direct statement of the labour of her Royal Highness the Princess Charlotte, the fatal issue of which has involved the whole nation in distress. You must excuse my being very concise, as I have been, and am, very much hurried. I take the opportunity of writing this in a lying-in chamber. Her Royal Highness's labour commenced by the discharge of the liquor amnii about seven o'clock on Monday evening, and the pains followed soon after. They continued through the night and a greater part of the next day—sharp, soft, but very ineffectual. Towards the evening Sir Richard Croft began to suspect that labour might not terminate without artificial assistance, and a message was despatched for me. I arrived at two on Wednesday morning. The labour was now advancing more favourably, and both Dr. Baillie and myself concurred in the opinion that it would not be advisable to inform her Royal Highness of my arrival. From this time to the end of her labour the progress was uniform, though very slow, the patient in good spirits, the pulse calm, and there never was room to entertain a question about the use of instruments. About six in the afternoon the discharge became of a green colour, which led to a suspicion that the child might be dead ; still the giving assistance was quite out of the question, as the pains now became more effectual, and the labour proceeded regularly, though slowly. The child was born without artificial assistance at nine o'clock in the evening. Attempts were made for a good while to re-animate it by inflating the lungs, friction, hot baths, &c., but without effect ; the heart could not be made to beat even once. Soon after delivery, Sir Richard Croft discovered that the uterus was contracted in the middle in the hour-glass form, and as some hæmorrhage commenced it was agreed that the placenta should be brought away by introducing the hand. This was done about half an hour after the delivery of the child with more ease and less blood than usual. Her Royal Highness continued well for about two hours ; she then complained of being sick at stomach, and of noise in the ears, began to be talkative, and her pulse became frequent ; but I understand she was very quiet after this, and her pulse calm. About half-past twelve o'clock she complained of severe pain in the chest, became extremely restless, with rapid, weak, and irregular pulse. At this time I saw her for the first time. It has been said that we had all gone to bed, but that is not a fact : Croft did not leave her room, Baillie retired about eleven, and I went to my bed-chamber and laid down in my clothes at twelve. By dissection, some bloody fluid (two ounces) was found in the pericardium, supposed to be thrown out *in articulo mortis.* The brain and other organs all sound, except the right ovarium, which was distended into a cyst the size of a hen's egg. The hour-glass contraction of the uterus still visible, and a considerable quantity of blood in the cavity of the uterus—but those present dispute about the quantity, so much as from twelve ounces to a pound and a half—her uterus extending as high as

occurrence.   Most obstetric works contain a formidable
catalogue of evils that may attend it, such as rupture of the

her navel. The cause of her Royal Highness's death is certainly somewhat
obscure; the symptoms were such as attend death from hæmorrhage, but
the loss of blood did not seem to be sufficient to account for a fatal issue.
It is possible that the effusion into the pericardium took place earlier than
was supposed, and it does not seem to be quite certain that this might not
be the cause. That I did not see her Royal Highness more early was awk-
ward, and it would have been better that I had been introduced before the
labour was expected; and it should have been understood that when labour
came on I should be sent to without waiting to know whether a consultation
was necessary or not. I thought so at the time, but I could not propose
such an arrangement to Croft. But this is entirely *entre nous*. I am glad
to hear that your son is well, and, with all my family, wish to be remembered
to him. We were happy to hear that he was agreeably married.

<div align="center">' I remain, my dear Doctor,</div>

<div align="center">' Ever yours most truly</div>

<div align="right">' John Sims, M.D.</div>

' This letter is confidential, as perhaps I might be blamed for writing
any particulars without the permission of Prince Leopold.'

What are the facts here shown? Here was a delicate young woman
prepared for the trial before her, as Baron Stockmar tells us, by ' lowering
the organic strength of the mother by bleeding, aperients, and low diet,' who
was allowed to go on in lingering feeble labour for no less than fifty-two
hours after the escape of the liquor amnii! Such was the groundless dread
of instrumental interference then prevalent that, although the case dragged
on its weary length with feeble, ineffectual pains, every now and then in-
creasing a little in intensity and then falling off again, it is stated ' there
never was room to entertain a question about the use of instruments ' ; and
even ' when the discharge became of a green colour . . . still the giving
assistance was quite out of the question ! ' Can any reasonable man doubt
that if the forceps had been employed hours and hours before—say on
Tuesday, when the pains fell off—the result would probably have been very
different, and that the life of the child, destroyed by the enormously prolonged
second stage, would have been saved? It must be remembered that early
on Tuesday morning delivery was expected, so that the head must then have
been low in the pelvis (*vide* Stockmar's ' Memoirs,' vol. i. p. 63). It would be
difficult to find a case which more forcibly illustrates the danger of delay in
the second stage of labour. Then what follows ? The uterus, exhausted
by the lengthy efforts it should have been spared, fails to contract effec-
tually; nor do we hear of any attempts to produce contraction by pressure.
The relaxed organ becomes full of clots, extending up to the umbilicus, and
all the most characteristic symptoms of concealed post-partum hæmorrhage
develop themselves. She complained ' of being sick at stomach, and of
noise in her ears, began to be talkative, and her pulse became frequent.'
Before long other symptoms came on, graphically described by Baron Stock-
mar, and which seem to point to the formation of a clot in the heart and
pulmonary arteries—a most likely occurrence after such a history. ' Baillie
sent me word that he wished me to see the Princess. I hesitated, but at
last went with him. She was suffering from spasms of the chest and diffi-

cervix, or even of the uterus itself, from the violence of the uterine action; laceration of the perinæum from the presenting part being driven through before dilatation has occurred; fainting from the sudden emptying of the uterus; hæmorrhage from the same cause. With regard to the child it is held that the pressure to which it is subjected, and sudden expulsion while the mother is in the erect position, may prove injurious. Without denying that these results may possibly occur now and again, in the majority of cases over-rapid labour is not attended with any evil effects.

Is only occasionally attended with bad results.

Depends on either excessive pains or undue laxity of the soft parts.

Its causes are not readily made out.

Precipitate labour may generally be traced to one of two conditions, or to a combination of both; excessive force and rapidity of the pains, or unusual laxity and want of resistance of the soft parts. The precise causes inducing these it is difficult to estimate. In some cases the former may depend on an undue amount of nervous excitability, and the latter on the constitutional state of the patient tending to relaxation of the tissues.

Whatever the cause, the extreme rapidity of labour is occasionally remarkable, and one strong pain may be sufficient to effect the expulsion of the child, with little or no preliminary warning. I have known a child to be expelled into the pan of a water-closet, the only previous indication of commencing labour being a slight griping pain which led the mother to fancy that an action of the bowels was about to take place. More often there is what may be described as a storm of uterine contractions, one pain following the other with great intensity, until the fœtus is expelled. The natural effect of this is to produce a great amount of alarm

culty of breathing, in great pain, and very restless, and threw herself continually from one side of the bed to the other, speaking now to Baillie, now to Croft. Baillie said to her—" Here comes an old friend of yours." She held out her left hand to me, hastily, and pressed mine warmly twice. I felt her pulse; it was going very fast—the beats now strong, now feeble, now intermittent.'

Here was evidently something different from the exhaustion of hæmorrhage; and no one who has witnessed a case of pulmonary obstruction can fail to recognise in this account an accurate delineation of its dreadful symptoms.

Surely this lamentable story can only lead to the conclusion that the unhappy and gifted Princess fell a victim to the dread of that bugbear, 'meddlesome midwifery,' which has so long retarded the progress of obstetrics.

<div style="text-align:right">I am, &c.,
W. S. Playfair.</div>

Curzon Street, Mayfair, W.: November 29, 1872.

or nervous excitement, which of itself forms one of the worst results of this class of labour. It is under such circumstances that temporary mania occurs, produced by the intensity of the suffering, under which the patient may commit acts her responsibility for which may fairly be open to question. *Occasionally produces much mental excitement.*

Little can be done in treating undue rapidity of labour. We can, to some extent, modify the intensity of the pains by urging the patient to refrain from voluntary efforts, and to open the glottis by crying out, so that the chest may no longer be a fixed point for muscular action. Opiates have been advised to control uterine action, but it is needless to point out that, in most cases, there is no time for them to take effect. Chloroform will often be found most valuable, from the rapidity with which it can be exhibited; and its power of diminishing uterine action, which forms one of its chief drawbacks in ordinary practice, will here prove of much service. *Little treatment possible.* *Chloroform is often of service.*

CHAPTER X.

LABOUR OBSTRUCTED BY FAULTY CONDITION OF THE SOFT PARTS.

Rigidity of the cervix a frequent cause of protracted labour.

ONE of the most frequent causes of delay in the first stage of labour is rigidity of the cervix uteri, which may depend on a variety of conditions. It is often produced by premature escape of the liquor amnii, in consequence of which the fluid wedge, which is Nature's means of dilating the os, is destroyed, and the hard presenting part is consequently

Its causes.

brought to bear directly upon the tissues of the cervix, which are thus unduly irritated, and thrown into a state of spasmodic contraction. At other times it may be due to constitutional peculiarities, among which there is none so common as a highly nervous and emotional temperament, which renders the patient peculiarly sensitive to her sufferings, and interferes with the harmonious action of the uterine fibres. The pains, in such cases, cause intense agony, are short and cramp-like in character, but have little or no effect in producing dilatation; the os often remaining for many hours without any appreciable alteration, its edges being thin and tightly stretched over the head. Less often, and this is generally met with in stout, plethoric women, the edges of the os are thick and tough.

Its effects.

The effects of prolongation of labour from this cause will vary much under different circumstances. If the liquor amnii be prematurely evacuated, the presenting part presses directly upon the cervix, and the case is then practically the same as if the labour was in the second stage. Hence grave symptoms may soon develop themselves, and early interference may be imperatively demanded. If the membranes be unruptured, delay will be of comparatively little moment, and considerable time may elapse without serious detriment to either the mother or child.

The treatment will naturally vary much with the cause, and the state of the patient. In the majority of cases, especially if the membranes be still intact, patience and time are sufficient to overcome the obstacle; but it is often in the power of the accoucheur materially to aid dilatation by appropriate management. Sometimes Nature overcomes the obstruction by lacerating the opposing structures; and cases are on record in which even a complete ring of the cervix has been torn off, and come away before the head.

Its treatment.

Many remedies have been recommended for facilitating dilatation, some of which no doubt act beneficially. Among those most frequently resorted to was venesection, and with it was generally associated the administration of nauseating doses of tartar emetic. Both these acted by producing temporary depression under which the resistance of the soft part was lessened. They probably answer best in cases in which there was a rigid and tough cervix; and they might prove serviceable, even yet, in stout, plethoric women of robust frame. Practically, they are now seldom, if ever, employed, and other and less debilitating remedies are preferred. The agent, *par excellence*, most serviceable is chloral, which is of special value in the more common cases in which rigidity is associated with spasmodic contraction of the muscular fibres of the cervix. Two or three doses of 15 grains, repeated at intervals of twenty minutes, are often of almost magical efficacy, the pains becoming steady and regular, and the os gradually relaxing sufficiently to allow the passage of the head. Should the chloral be rejected by the stomach, it may be satisfactorily administered per rectum. Chloroform acts much in the same way, but on the whole less satisfactorily, its effects being often too great; while the peculiar value of chloral is its influence in promoting relaxation of the tissues, without interfering with the strength of the pains.

Venesection and tartar emetic.

The use of chloral and chloroform.

Various local means of treatment may be also advantageously used. One is the warm bath, which is much used in France. It is of unquestionable value where there is mere rigidity, and may be used either as an entire bath, or as a hip-bath, in which the patient sits from twenty minutes to half an hour. The objection is the fuss and excitement it causes, and, for this reason, it is an expedient seldom

Local means of treatment.

resorted to in this country. A similar effect is produced, and much more easily, by a douche of tepid water upon the cervix. This can be very easily administered, the pipe of a Higginson's syringe being guided up to the cervix by the index finger of the right hand, and a stream of water projected against it for five or ten minutes. Smearing the os with extract of belladonna is advised by Continental authorities, but its effects are more than doubtful. Horton [1] advocates the injection into the tissue of the cervix of $\frac{1}{40}$ of a grain of atropine by means of a hypodermic syringe, and speaks very favourably of the practice.

Artificial dilatation.

Artificial dilatation of the cervix by the finger has often been recommended, and has been the subject of much discussion, especially in the Edinburgh school, where it was formerly commonly employed. It is capable of being very useful, but it may also do much injury when roughly and injudiciously used. The class of cases in which it is most serviceable are those in which the liquor amnii has been long evacuated, and in which the head, covered by the tightly stretched cervix, has descended low into the pelvic cavity. Under these circumstances, if the finger be passed gently within the os during a pain, and its margin pressed upwards and over the head as it were, while the contraction lasts, the progress of the case may be materially facilitated. This manœuvre is somewhat similar to that which has been already spoken of, when the anterior lip of the cervix is caught between the head and the pubic bone, and, if properly performed, I believe it to be quite safe, and often of great value. It is not, however, well adapted for those cases in which the membranes are still intact, or in which the os remains undilated when the head is still high in the pelvis. When there is much delay under these conditions, and interference of some kind seems called for, the dilatation

The use of india-rubber dilators.

may be much assisted by the use of caoutchouc dilators, described in the chapter on the induction of premature labour, which imitate Nature's method of opening up the os, and also act as a direct stimulant to uterine contraction. But it should be remembered that it is precisely in such cases that delay is least prejudicial. If, however, the os be excessively long in opening, its dilatation may be safely and

[1] *Amer. Journ. of Obst.* July, 1878.

efficiently promoted by passing within it, and distending with water, one of the smallest-sized bags ; and, after this has been in position from ten to twenty minutes, it may be removed, and a larger one substituted.

Every now and again we meet with cases in which the obstacle depends upon organic changes in the cervix, the most common of which are cicatricial hardening from former lacerations; hypertrophic elongation of the cervix from disease antecedent to pregnancy; or even agglutination and closure of the os uteri. Cicatrices are generally the result of lacerations during former labours. They implicate a portion only of the cervix, which they render hard, rigid, and undilatable, while the remainder has its natural softness. They can readily be made out by the examining finger. A somewhat similar, but much more formidable, obstruction is occasionally met with in cases of old standing hypertrophic elongation of the cervix, which is generally associated with prolapse. In most cases of this kind the cervix becomes softened during pregnancy, so that dilatation occurs without any unusual difficulty. But this does not always happen. A good example is related by Mr. Roper, in the seventh volume of the ' Obstetrical Transactions,' in which such a cervix formed an almost insuperable obstacle to the passage of the child.

Rigidity depending upon organic causes.

Cicatrices.

Hypertrophic elongation of cervix.

Carcinoma of the cervix uteri, which produces extensive thickening and induration of its tissues, and even advanced malignant disease of the uterus, is no bar to conception. The relations of malignant disease to pregnancy and parturition have recently been well studied by Dr. Herman.[1] He concludes that cancer renders the patient inapt to conceive, but that when pregnancy does occur there is a tendency to the intra-uterine death and premature expulsion of the fœtus, and the growth of the cancer is accelerated. When delivery is accomplished naturally there is generally expansion of the cervix by fissuring of its tissue, but the harder forms of cancer may form an insuperable obstacle to delivery.

Carcinoma.

Agglutination of the margins of the os uteri is occasionally met with, and must, of course, have occurred after conception. It is generally the result of some inflammatory

Occlusion of the os.

[1] *Obst. Trans.* vol. xx. p. 191.

affection of the cervix during the early months of gestation ; and I have known it recur in the same woman in two successive pregnancies. Usually it is not associated with any hardness or rigidity, but the entire cervix is stretched over the presenting part, and forms a smooth covering, in which the os may only exist as a small dimple, and may be very difficult to detect at all. Occlusion of the os uteri from inflammatory change sometimes so alters the cervix that no sign of the original opening can be discovered ; and in two such instances the Cæsarean operation has been performed in the United States, by which the women were saved.[1]

Their treatment. Any of these mechanical causes of rigidity may at first be treated in the same way as the more simple cases ; and with patience, the use of chloral and chloroform, and of the fluid dilators, sufficient expansion to permit the passage of the head will often take place. But if these methods produce no effect, and symptoms of constitutional irritation are beginning to develop themselves, other, and more radical, means of overcoming the obstruction may be required.

Incision of the cervix. Under such circumstances incision of the cervix may be not only justifiable but essential, and it frequently answers extremely well. On the Continent it is resorted to much more frequently and earlier than in this country, and with the most beneficial results. The operation offers no difficul- **Mode of operation.** ties. The simplest way of performing it is to guard the greater portion of the blade of a straight blunt-pointed bistoury by wrapping lint or adhesive plaster round it, leaving about half an inch cutting edge towards its point. This is guided to the cervix, on the under surface of the index finger, and three or four notches are cut in the circumference of the os to about the depth of a quarter of an inch. Very generally, especially when the obstruction is only due to old cicatrices, the pains will now speedily effect complete expansion, which may be very advantageously aided by applying the hydrostatic dilators. When the obstruction is due to carcinomatous infiltration or inflammatory thickening, the case is much more complicated, and will painfully tax the resources of the accoucheur. If it is possible, the disease should be removed as much as can be safely done during pregnancy, which should also be brought to an end before

[1] Harris's note to second American edition.

the full period.   During labour incisions should form a pre-
liminary to any subsequent proceedings that may be neces-
sary, as they are, at the worst, not likely to increase in the
least the risk the patient has to run, and they may possibly
avert more serious operations.   In the case of malignant
disease the risk of serious hæmorrhage, from the great
vascularity of the tissues, must not be forgotten, and, if
necessary, means must be taken to check this by local
styptics, such as perchloride of iron.   If incision fail, and
the state of the patient demands speedy delivery, the forceps
may be applied, and Herman thinks they are, as a rule,
better than turning.   He also maintains that there is little
difference in the risk to the mothers between craniotomy and
the Cæsarean section, and that the possibility of saving the
child in cases in which incisions have failed should induce
us to prefer the latter.

Before performing craniotomy, when the os is sufficiently
open, a cautious application of the forceps is quite justifiable.
Steady and careful downward traction, combined with digital
expansion, has often enabled a head to pass with safety
through an os that has resisted all other means of dilatation,
and the destruction of the child has thus been avoided.   If,
indeed, the os appear to be dilatable, this procedure may
advantageously be adopted before incision, and, as a matter
of fact, it is commonly practised in the Rotunda Hospital.
An operation involving, beyond doubt, of itself some risk,
and requiring considerable operative dexterity, would natu-
rally not be lightly and inconsiderately undertaken.   But
when it is remembered that the alternative is the destruction
of the child, the risk of exhaustion, and at least as great
mechanical injury to the mother, its difficulty need not stand
in the way of its adoption.

*Applica-
tion of the
forceps
within the
cervix.*

When the os is apparently obliterated, incision is the
only resource.   Before resorting to it the patient should be
placed under chloroform, and the entire lower segment of
the uterus carefully explored.   Possibly the aperture may
be found high up, and out of reach of an ordinary examina-
tion, or we may detect a depression corresponding to its site.
A small crucial incision may then be made at the site of the
os, if this can be ascertained; if not, at the most prominent
portion of the cervix.   Very generally the pains will then

*Treat-
ment
when
occlusion
of the os
exists.*

suffice to complete expansion, which may be further aided by the fluid dilators.

Ante-par-
tum hour-
glass con-
traction.
Dr. Hosmer [1] has recently drawn attention to a hitherto undescribed species of dystocia, which he terms '*ante-partum hour-glass contraction*,' and which he believes to depend on constriction of the uterine fibres at the site of the internal os uteri. Harris [2] doubts its limitation to the internal os uteri, and terms it '*tetanoid falciform constriction of the uterus*.' Whatever its site, in the cases recorded difficulties of the most formidable kind arose from this cause. The pelves were normal and the presentations natural, yet out of seven labours four ended fatally, two before delivery. The constriction seems to have grasped the foetus with such force as to have rendered extraction, either by the forceps or turning, impossible. I have no personal experience of this complication, which must fortunately be very rare. The introduction of the hand, the patient being deeply anæsthetised, would probably render diagnosis easy. The treatment must depend on the force and amount of constriction. If the constriction does not relax under chloroform, chloral, or the injection of atropine into the site of constriction, as recommended by Horton in rigidity of the cervix, turning would probably be our best resource. Should this fail, the Cæsarean section may be required to effect delivery, as happened in a case recorded by Dr. T. A. Foster, of Portland, Maine. Gastro-elytrotomy is obviously unsuitable for such cases.

Bands and
cicatrices
in the
vagina.
Extreme rigidity of the vagina, or bands and cicatrices in or across its walls, the result of congenital malformation, of injuries in former labours, or of antecedent disease, occasionally obstruct the second stage. There is seldom any really formidable difficulty from this cause, since the obstruction almost always yields to the pressure of the presenting part. If there be any considerable extent of cicatrices in the vagina, artificial assistance may be required. If we should be aware of their existence during pregnancy, and find them to be sufficiently dense and extensive to be likely to interfere with delivery, an endeavour may be made to dilate them gradually by hydrostatic bags or bougies. If

[1] *Boston Med. and Surg. Journ.* March and May 1878.
[2] Harris's note to second American edition.

they be not detected until labour is in progress, we must be
guided in our procedure by the pressure to which they are
subjected. It may then be necessary to divide them with a
knife, and to hasten the passage of the head by the forceps,
so as to prevent contusion as much as possible. It is ob-
viously impossible to lay down any positive rules for such
rare contingencies, the treatment suitable for which must
necessarily vary much with the individual peculiarities of
the case.

Extreme rigidity of the perinæum is often dependent
upon cicatricial hardening from injury in previous labours.
This may greatly interfere with its dilatation ; and if lacera-
tion seems inevitable, we may be quite justified in attempt-
ing to avert it by incision of the margins of the perinæum,
on the principle of a clean cut being always preferable to a
jagged tear. Extreme rigidity of the perinæum.

Occasionally we meet with very formidable obstacles from
tumours connected with the maternal structures. These are
most commonly either fibroid or ovarian, although others
may be met with, such as malignant growths from the pelvic
bones, exostoses, &c. Labour complicated with tumour.

Considering the frequency with which women suffer from
fibroid tumours of the uterus, it is perhaps somewhat re-
markable that they do not more often complicate delivery.
Probably women so affected are not apt to conceive. Occa-
sionally, however, cases of this kind cause much anxiety. Fibroid tumours of the uterus.
Of course, the cases are most grave in which tumours are so
situated as to encroach upon the cavity of the pelvis, and
mechanically obstruct the passage of the child. Even those
in which this does not occur are by no means free from
danger, for interstitial and sub-peritoneal fibroids, situated
in the upper parts of the uterus, and leaving the pelvic
cavity quite unimplicated, may interfere with the action of
the uterine fibres, prevent subsequent contraction, cause
profuse post-partum hæmorrhage, or even predispose to rup-
ture of the uterine tissue. Hence, every case in which the
existence of uterine fibroids has been ascertained must be
anxiously watched. The risk of hæmorrhage is perhaps the
greatest ; for, if the tumours be at all large, efficient contrac-
tion of the uterus after the birth of the child must be more
or less interfered with. Fortunately it is not so common as They are most likely to prove dangerous when encroaching on the pelvic cavity.

might almost be expected. Out of 5 cases recorded in the
'Obstetrical Transactions,' 2 of which were in my own prac-
tice, no hæmorrhage occurred; nor does it seem to have
happened in any of the 26 cases collected by Magdelaine in
his thesis on the subject. I recently saw an interesting
example of this in a patient, whose case was looked forward
to with much anxiety, in consequence of the existence of
several enormous fibroid masses projecting from the fundus
and anterior surface of the body of the uterus, and whose
labour was, nevertheless, typically normal in every way.
Should hæmorrhage occur after delivery, the injection of
styptic solutions would probably be peculiarly valuable, since
the ordinary means of promoting contraction are likely to
fail.

It is when the fibroid growths implicate the lower uterine
zone and the cervical region that the greatest difficulties
are likely to be met with. The practice then to be adopted
must be regulated to a great extent by the nature of each
individual case. If it be possible to push the tumour above
the pelvic brim, out of the way of the presenting part, that,
no doubt, is the best course to pursue, as not only clearing
the passage in the most effectual way, but removing the
tumour from the bruising to which it would otherwise be
subjected when pressed between the head and the pelvic
walls, which seems to be one of the greatest dangers of this
complication. This manœuvre is sometimes possible in what
seem to be the most unpromising circumstances. An in-
teresting example is narrated by Sir Spencer Wells,[1] who,
called to perform the Cæsarean section, succeeded, although
not without much difficulty, in pushing the obstructing mass
above the brim, the child subsequently passing with ease. I
have myself elsewhere recorded two similar cases[2] in which
I was enabled to deliver the patient by pushing up the
obstructing tumour, in both of which the Cæsarean section
would have been inevitable had the attempt at reposition
failed. Therefore, before resorting to more serious operative
procedures, a determined effort at pushing the tumour out
of the way should be made, the patient being deeply
chloroformed, and, if necessary, upward pressure being made
by the closed fist passed into the vagina.

*Reposi-
tion of the
tumour.*

[1] *Obst. Trans.* vol. ix. p. 73.   [2] *Ibid.* vol. xix. p. 101.

Failing this, the possibility of enucleating the tumour, or, if that be not possible, of removing it piecemeal with the écraseur, should be considered. On account of the loose attachments of these growths, and the facility with which they can be removed in this way in the non-pregnant state, the expedient seems certainly well worthy a trial, if their site and attachments render it at all feasible. Interesting examples of the successful performance of this operation are recorded by Danyau and Braxton Hicks. Should it be found impracticable, the case must be managed in reference to the

Enuclea-tion or ablation.

Fig. 123.
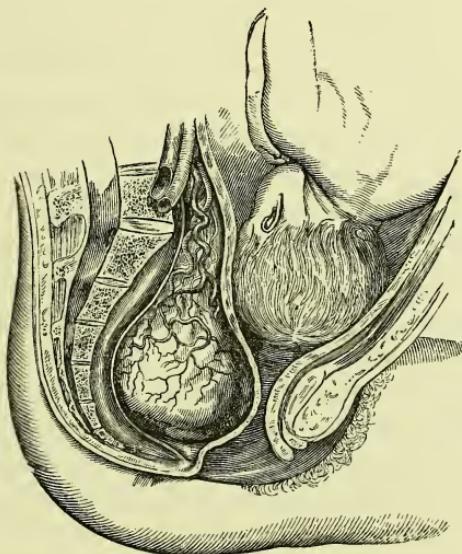
LABOUR COMPLICATED BY OVARIAN TUMOUR.

amount of obstruction; and the forceps, craniotomy, or even the Cæsarean section may be necessary.

The next most common class of obstructing tumours are those of the ovary (fig. 123), and it is apparently not the largest of these which are most apt to descend into the pelvic cavity. When the tumour is of any considerable size, its bulk is such that it cannot be contained in the true pelvis, and it rises into the abdominal cavity with the uterus. Hence, the existence of the tumour that offers the most formidable obstacle to delivery is rarely suspected before labour sets in.

In order to estimate the results of the various methods

Tumours of the ovaries.

of treatment, I have tabulated 57 cases.[1] In 13 labour was terminated by the natural powers alone ; but of these 6 mothers, or nearly one half, died. In favourable contrast with these, we gave the cases in which the size of the tumour was diminished by puncture. These are 9 in number, in all of which the mother recovered ; 5 out of the 6 children being saved. The reason of the great mortality in the former cases is apparently the bruising to which the tumour, even when small enough to allow the child to be squeezed past it, is necessarily subjected. This is extremely apt to set up a fatal form of diffuse inflammation, the risk of which was long ago pointed out by Ashwell,[2] who draws a comparison between cases in which such tumours have been subjected to contusion and cases of strangulated hernia ; and the cause of death in both is doubtless very similar. This

Puncture of the obstructing tumour should always be performed.

danger is avoided when the tumour is punctured, so as to become flattened between the head and the pelvic walls. On this account I think it should be laid down as a rule that puncture should be performed in all cases of ovarian tumour engaged in front of the presenting part, even when it is of so small a size as not to preclude the possibility of delivery by the natural powers.

In 5 of the 57 cases it was found possible to return the tumour above the pelvic brim, and in these also the termination was very favourable, all the mothers recovering. Should

Treatment when puncture fails.

puncture not succeed, and it may fail on account of the gelatinous and semi-solid nature of the contents of the cyst, it may be possible to dispose of the tumour in this way, even when it seems to be firmly wedged down in front of the presenting part, and to be hopelessly fixed in its unfavourable position.

Failing either of these resources, it may be necessary to resort to craniotomy, provided the size of the tumour precludes the possibility of delivery by forceps.

The question of the effect on labour of ovarian tumour which does not obstruct the pelvic canal is one of some interest, but there are not a sufficient number of cases recorded to throw much light on it. I am disposed to think that labour generally goes on favourably. What delay there is depends on the inefficient action of the accessory muscles

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[1] *Obst. Trans.* vol. ix.   [2] *Guy's Hospital Reports*, vol. ii.

engaged in parturition, on account of the extreme distension of the abdomen.

There are a few other conditions connected with the maternal structures which may impede delivery, but which are of comparatively rare occurrence.

Amongst them is vaginal cystocele, consisting of a prolapse of the distended bladder in front of the presentation, where it forms a tense fluctuating pouch, which has been mistaken for a hydrocephalic head, or for the bag of membranes. This complication is only likely to arise when the bladder has been allowed to become unduly distended from want of attention to the voiding of urine during labour. The diagnosis should not offer any difficulty, for the finger will be able to pass behind, but not in front of, the swelling, and reach the presenting part; while the pain and tenesmus will further put the practitioner on his guard. The treatment consists in emptying the bladder: but there may be some difficulty in passing the catheter, in consequence of the urethra being dragged out of its natural direction. A long elastic male catheter will almost always pass, if used with care and gentleness. Should it be found impossible to draw off the water—and this is said to have sometimes happened —the tense pouch might be punctured without danger by the fine needle of an aspirator trocar, and its contents withdrawn. When once the viscus is emptied, it can easily be pushed above the presenting part in the intervals between the pains.

Vaginal cystocele.

In some few cases difficulties have arisen from the existence of a vesical calculus. Should this be pushed down in front of the head, it can readily be understood that the maternal structures would run the risk of being seriously bruised and injured. Should we make out the existence of a calculus—and, if the presence of one be suspected, the diagnosis could easily be made by means of a sound—an endeavour should be made to push it above the brim of the pelvis. If that be found to be impossible, no resource is left but its removal, either by crushing, or by rapid dilatation of the urethra, followed by extraction. Should we be aware of the existence of a calculus during pregnancy, its removal should certainly be undertaken before labour sets in.

Vesical calculus.

Hernial protrusion in Douglas's space may sometimes

<div style="float:left">Hernial protrusion.</div>

give rise to anxiety, from the pressure and contusion to which it is necessarily subjected.   An endeavour must be made to replace it, and to moderate the straining efforts of the patient ; and it may even be advisable to apply the forceps so as to relieve the mass from pressure as soon as possible. It is, however, of great rarity. Fordyce Barker, in an interesting paper on the subject,[1] records several examples, and states that he has met with no instance in which it has led to a fatal result, either to mother or child, although it cannot but be considered a serious complication.

<div style="float:left">Scybalous masses in the intestines.</div>

Scybalous masses in the intestines may be so hard and impacted as to form an obstruction.   The necessity of attending to the state of the rectum has already been pointed out.   Should it be found impossible to empty the bowel by large enemata, the mass must be mechanically broken down and removed by the scoop.

<div style="float:left">Œdema of the vulva.</div>

Excessive œdematous infiltration of the vulva may sometimes cause obstruction, and require diminution in size, which can easily be effected by numerous small punctures.

<div style="float:left">Hæmatic effusions in connection with labour.</div>

Hæmatic effusions into the cellular tissue of the vulva or vagina form a grave complication of labour.   Such blood-swellings are most usually met with in one or both labia, or under the vaginal wall ; in the gravest forms, the blood may extend into the tissues for a considerable distance, as in the case recorded by Cazeaux, where it reached upwards as far as the umbilicus in front, and as far as the attachment of the diaphragm behind.

<div style="float:left">Conditions favouring the accident.</div>

The conditions associated with pregnancy, the distension and engorgement to which the vessels are subjected, the interference with the return of the blood by the pressure of the head during labour, and the violent efforts of the patient, afford a ready explanation of the reason why a vessel may be predisposed to rupture and admit of the extravasation of blood.

<div style="float:left">Its dangers are considerable.</div>

The accident is fortunately far from a common one, although a sufficient number of cases are recorded to make us familiar with its symptoms and risks.   The dangers attending such effusions would seem to be great, if the statistics given by those who have written on the subject are to be trusted.   Thus, out of 124 cases collected by various

[1] *Amer. Journ. of Obst.* vol. ix.

French authors, 44 proved fatal. Fordyce Barker points out that, since the nature and appropriate treatment of the accident have been more thoroughly understood, the mortality has been much lessened; for out of 15 cases reported by Scanzoni only 1 died, and out of 22 cases he had himself seen 2 died, and all these three deaths were from puerperal fever, and not the direct result of the accident.[1]

The blood may be effused into any part of the pelvic cellular tissue, or into the labia. The accident most often happens during labour when the head is low down in the pelvis, not unfrequently just as it is about to escape from the vulva. Hence the extravasation is more often met with low down in the vagina, and more frequently in one of the labia than in any other situation. I have met with a case in which I had every reason to believe that an extravasation of blood had occurred within the tissues immediately surrounding the cervix. It is natural to suppose that a varicose condition of the veins about the vulva would predispose to the accident, but in most of the recorded examples this is not stated to have been the case. Still, if varicose veins exist to any marked degree, some anxiety on this point cannot but be felt.

Situation of the blood-effusion.

The thrombus occasionally, though rarely, forms before delivery. Most commonly it first forms towards the end of labour, or after the birth of the child. In the latter case it is probable that the laceration in the vessels occurred before the birth of the child, and that the pressure of the presenting part prevented the escape of any quantity of blood at the time of laceration.

Time of occurrence.

The symptoms are not by any means characteristic. Pain of a tearing character, occasionally very intense, and extending to the back and down the thighs, is very generally associated with the formation of the thrombus. If a careful physical examination be made, the nature of the case can readily be detected. When the blood escapes into the labium, a firm, hard swelling is felt, which has even been mistaken for the fœtal head. If the effusion implicate the internal parts only, the diagnosis may not at first be so evident. But even then a little care should prevent any mistake, for the swelling may be felt in the vagina, and may

Its symptoms.

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[1] *The Puerperal Diseases*, p. 60.

even form an obstacle to the passage of the child. Cazeaux mentions cases in which it was so extensive as to compress the rectum and urethra, and even to prevent the exit of the lochia. In some cases the distension of the tissues is so great that they lacerate, and then hæmorrhage, sometimes so profuse as directly to imperil the life of the patient, may occur. The bursting of the skin may take place some time subsequent to the formation of the thrombus. Constitutional symptoms will be in proportion to the amount of blood lost, either by extravasation or externally, after the rupture of the superficial tissues. Occasionally they are considerable, and are the same as those of hæmorrhage from any cause.

*Sponta-
neous
laceration.*

The terminations of thrombus are either spontaneous absorption, which may occur if the amount of blood extravasated be small; or the tumour may burst, and then there is external hæmorrhage; or it may suppurate, the contained coagula being discharged from the cavity of the cyst; or, finally, sloughing of the superficial tissues has occurred.

*Its termi-
nations.*

The treatment must naturally vary with the size of the thrombus, and the time at which it forms. If it be met with during labour, unless it be extremely small it will be very apt to form an obstruction to the passage of the child. Under such circumstances it is clearly advisable to terminate the labour as soon as possible, so as to remove the obstacle to the circulation in the vessels. For this purpose the forceps should be applied as soon as the head can be easily reached. If the tumour itself obstruct the passage of the head, or if it be of any considerable size, it will be necessary to incise it freely at its most prominent point and turn out the coagula, controlling the hæmorrhage at once by filling the cavity with cotton wadding saturated in a solution of perchloride of iron, while at the same time digital compression with the tips of the fingers is kept up. By this means pressure is applied directly to the bleeding point, and the hæmorrhage can be controlled without difficulty. This is all the more necessary if spontaneous rupture have taken place, for then the loss of blood is often profuse, and it is of the utmost importance to reach the site of the hæmorrhage as nearly as possible.

*Its treat-
ment
when
formed
during
labour.*

If the thrombus be not so large as to obstruct delivery, or if it be not detected until after the birth of the child, the

*Treatment
when the*

question arises whether the case should not be left alone, in the hope that absorption may occur, as in most cases of pelvic hæmatocele. This expectant treatment is advised by Cazeaux, and it seems to be the most rational plan we can adopt. True, it may take a longer time for the patient to convalesce completely than if the coagula were removed at once, and the hæmorrhage restrained by pressure on the bleeding point; but this disadvantage is more than counterbalanced by the absence of risk from hæmorrhage, and of septicæmia from the suppuration that must necessarily follow. Softening and suppuration may in many cases occur in a few days, necessitating operation, but the vessels will then be probably occluded, and the risk of hæmorrhage much lessened. Dr. Fordyce Barker, however, holds the opposite opinion, and thinks that the proper plan is to open the thrombus early, controlling the hæmorrhage in the manner already indicated, unless the thrombus is situated high in the vaginal canal.

thrombus is small or forms after delivery.

Whenever the cavity of a thrombus has been opened, either by incision or by spontaneous softening at some time subsequent to its formation, it must not be forgotten that there is considerable risk of septic absorption. To avoid this, care must be taken to use antiseptic dressings freely, such as iodoform powder or wool, applied directly to the part, and frequent vaginal injections of diluted Condy's fluid. Barker lays special stress on the importance of not removing prematurely the coagula formed by the styptic applications, for fear of secondary hæmorrhage, but of allowing them to come away spontaneously.

Risk of subsequent septicæmia.

CHAPTER XI.

DIFFICULT LABOUR DEPENDING ON SOME UNUSUAL CONDITION
OF THE FŒTUS.

Plural births.

The presence of a second fœtus is rarely suspected until after the birth of the first.

THE subject of multiple pregnancy in general having already been fully considered, we have now only to discuss its practical bearing as regards labour. Fortunately, the existence of twins rarely gives rise to any serious difficulty. In the large proportion of cases the presence of a second fœtus is not suspected until the birth of the first, when the nature of the case is at once apparent from the fact of the uterus remaining as large, or nearly as large, as it was before.

The uterus acts at a disadvantage.

There may possibly be some delay in the birth of the first child, inasmuch as the extreme distension of the uterus may interfere with its thoroughly efficient action ; while, in addition, the uterine pressure is not directly conveyed to the ovum as in single births, but indirectly through the amniotic sac of the second child (fig. 124). Such delay is especially apt to arise when the first child presents by the breech, for, even if the body be expelled spontaneously, difficulty is likely to occur with the head, since the uterus does not contract upon it as is ordinarily the case. Hence the intervention of the accoucheur to save the life of the child, by the extraction of the head, will be almost a matter of necessity.

In the majority of cases, after the birth of the first child, there is a temporary lull in the pains, which soon recommence, generally in from ten to twenty minutes, and the second child is rapidly expelled ; for, on account of the full dilatation of the soft parts, there is no obstacle to its delivery. Sometimes there is a considerable interval before the pains recur, and instances are recorded in which even several days elapsed between the births of the two children.

In most cases the management of twins does not differ Treatment. from that of ordinary labour. As soon as we are certain of the existence of a second fœtus, we should inform the by-

Fig. 124.
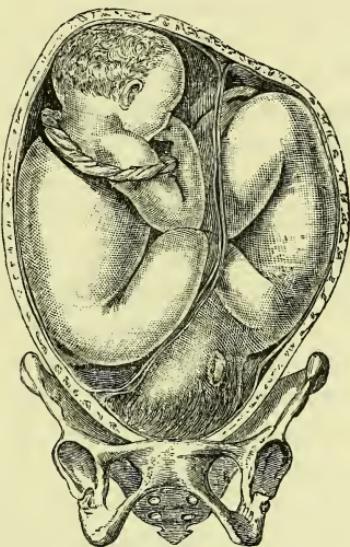
TWIN PREGNANCY, BREECH AND HEAD PRESENTING.

standers, but not necessarily the mother, to whom the news might prove an unpleasant and even dangerous shock. Then, having taken care to tie the cord of the first child for fear of vascular communication between the placentæ, our duty is to wait for a recurrence of the pains. If these come on rapidly, and the presentation of the second fœtus be normal, its birth is managed in the usual way.

If there be any unusual delay, we have to consider the proper course to pursue, and on this the opinions of authorities differ greatly. Some advise a delay of several hours, and even more, if pains do not recur spontaneously; while others —Murphy, for example—recommend that the second child should be delivered at once. Either extreme of practice is probably wrong, and the safest and best course is, doubtless, the medium one. The second point to bear in mind is, that in multiple pregnancy, on account of the extreme distension of the uterus, there is a tendency to inertia, and consequently to post-partum hæmorrhage; and that, therefore, it is better that the birth of the second child should be delayed, even for

Management when there is delay after the birth of the first child.

Necessity of preventing uterine inertia.

a considerable time, rather than the patient should run the risk attending an empty and uncontracted uterus. If, however, uterine action be present, there is an obvious advantage in the delivery of the second child before the dilatation of the passages passes off.

Endeavours should be made to excite uterine action.

Rupture of membranes of second child.

The best plan would seem to be, if, after waiting a quarter of an hour, labour pains do not occur, to try and induce them by uterine friction and pressure, and by the administration of a dose of ergot, to which, as there can be no obstacle to the rapid birth of the second child, there can be now no objection. The membranes of the second child should always be ruptured at once, if easily within reach, as one of the speediest means of inducing contraction. If no progress be made, and speedy delivery be indicated—a necessity which may arise either from the exhausted state of the patient, the presence of hæmorrhage, extremely feeble pulsations of the fœtal heart (showing that the life of the second child is endangered), or malpresentations of the second fœtus—

Turning is generally the best expedient if speedy delivery be indicated.

turning is probably the readiest and safest expedient. Under such circumstances the operation is performed with great ease, since the passages are amply dilated. After bringing down the feet, the birth of the body should be slowly effected, with the view of insuring as complete subsequent contraction as possible. If the head has descended in the pelvis, of course turning is impossible, and the forceps must be applied.

Difficulties arising from locked twins.

These chiefly arise when the twins have a common amnion.

Occasionally very serious difficulties arise from parts of both fœtuses presenting simultaneously, and thus impeding the entrance of either child into the pelvis, or getting locked together, so as to render delivery impossible without artificial aid. Such difficulties are not apt to arise in the more ordinary cases, in which each child has its own bag of membranes, since then the fœtuses are kept entirely separate; but in those in which the twins are contained in a common amniotic cavity, or in which both sacs have burst simultaneously. They are very puzzling to the obstetrician, and it may be far from easy to discover the cause of the obstruction. Nor is it possible to lay down any positive rules for their management, which must be governed, to a considerable extent, by the circumstances of each individual case.

Both heads pre-

Sometimes both heads present simultaneously at the

brim, and then neither can enter unless they be unusually small or the pelvis very capacious, when both may descend; or rather the first head may descend low into the pelvic cavity, and then the second head enters the brim, and gets jammed against the thorax of the first child (fig. 125). Reimann [1] relates a curious example of this, in which he delivered the head first with the forceps, but found the body would not follow, and, on examination, a second head was found in the pelvis. He then applied the forceps to the

Fig. 125.
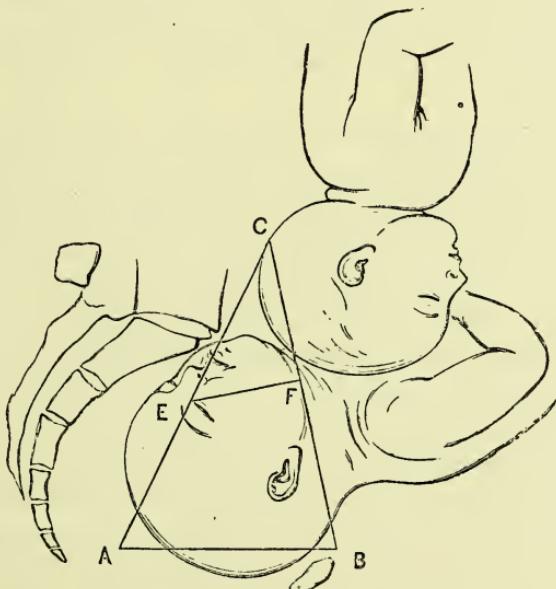
SHOWS HEAD-LOCKING, BOTH CHILDREN PRESENTING HEAD FIRST. (After Barnes.)

second head; the body of the first child was then born, and afterwards that of the second. Such a mechanism must clearly have been impossible unless the pelvis had been extremely large.

Whenever both heads are felt at the brim, it will generally be found possible to get one out of the way by appropriate manipulation, one hand being passed into the vagina, the other aiding its action from without. Then the forceps may be applied to the other head, so as to engage it at once in the pelvic cavity. If both have actually passed into the pelvis, as in the case just alluded to, the difficulty

[1] *Arch. f. Gynak.* 1871.

will be much greater. It will generally be easier to push up the second head, while the lower is drawn out by the forceps, than to deliver the second, leaving the first *in situ*.

Foot or hand with head. In other cases a foot or a hand may descend along with the head, and even the four feet may present simultaneously. The rule in the former case is to push the part descending with the head out of the way, and in the latter to disengage one child as soon as possible. Great care is necessary, or we might possibly bring down the limbs of separate children.

Two heads interlocking in head and breech presentations. The most common kind of difficulty is when the first child presents by the breech, and is delivered as far as the head, which is then found to be locked with the head of the second child, which has descended into the pelvic cavity (fig. 126).

Here it is clear that the obstruction must be very great, and, unless the children are extremly small, insuperable. The first endeavour should be to disentangle the heads; this is sometimes feasible if the second be not deeply engaged in the pelvis, and the hand be passed up so as to push it out of the way. This will but rarely succeed; then it may be possible to apply the forceps to the second head and drag it past the body of the first child, and this is the method recommended by Reimann, who has written an excellent paper on the subject.[1] Generally the sacrifice of one of the children is essential, and as the body of the first child must have been born for some time, it is probable that the pressure to which it has been subjected will have already imperilled, if it has not destroyed, its life, and therefore the plan usually recommended is to decapitate. This can easily be done with scissors or a wire écraseur, after which the second child is expelled without difficulty, leaving the head of the first in utero to be subsequently dealt with.

Another mode of managing these cases is to perforate the upper head and draw it past the lower with the cephalotribe or craniotomy forceps. This plan has the disadvantage of probably sacrificing both children, since the other child can hardly survive the pressure and delay, whereas the former plan gives the second child a fair chance of being born alive.

Double monsters. In connection with the subject of twin labour we may consider those rare cases in which the bodies of the fœtuses

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[1] *American Journal of Obstetrics*, January 1877.

are partially fused together.   The mechanism and management of delivery in cases of double monstrosity have attracted comparatively little attention, no doubt because authors have

Fig. 126.
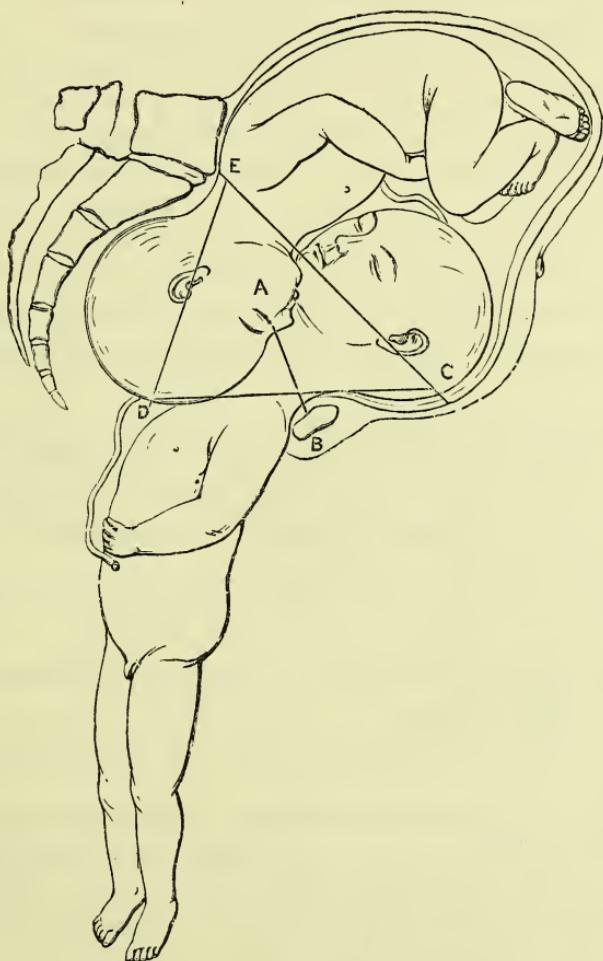
SHOWS HEAD-LOCKING, FIRST CHILD COMING FEET FIRST; IMPACTION OF HEADS FROM WEDGING IN BRIM.   (After Barnes.)

D. Apex of wedge.   E, C. Base of wedge which cannot enter brim.   A, B. Line of decapitation to decompose wedge, and enable head of second child to pass.

considered them matters of curiosity merely, rather than of practical importance.

The frequent occurrence of such monstrosities in our museums, and the numerous cases scattered through our periodical literature, are sufficient to show that they are not so very rare as we might be inclined to imagine; and, as

they are likely to give rise to formidable difficulties in delivery, it cannot be unimportant to have a clear idea of the usual course taken by nature in effecting such births, with a view of enabling us to assist in the most satisfactory manner should a similar case come under our observation.

Unfortunately the authors who have placed on record the birth of double monsters have generally occupied themselves more with a description of the structural peculiarities of the fœtuses than with the mechanism of their delivery; so that, although the cases to be met with in medical literature are very numerous, comparatively few of them are of real value from an obstetric point of view. Still, I have been able to collect the details of a considerable number[1] in which the history of the labour is more or less accurately described; and doubtless a more extensive research would increase the list.

Double monstrosity may be divided into four classes.

For obstetric purposes we may confine our attention to four principal varieties of double monstrosity, which are met with far more frequently than any others. These are:—

A. Two nearly separate bodies united in front, to a varying extent, by thorax or abdomen.

B. Two nearly separate bodies united back to back by the sacrum and lower part of the spinal column.

C. Dicephalous monsters, the bodies being single below, but the heads separate.

D. The bodies separate below, but the heads partially united.

This classification by no means includes all the varieties of monsters that we may meet with. It does, however, include all that are likely to give rise to much difficulty in delivery; and all the cases I have collected may be placed under one of these divisions.

In a large number of cases delivery is effected by the natural powers.

The first point that strikes us in looking over the history of these deliveries is the frequency with which they have been terminated by the natural powers alone, without any assistance on the part of the accoucheur. Thus, out of the 31 cases, no less than 20 were delivered naturally, and apparently without much trouble. Nothing can better show the wonderful resources of nature in overcoming difficulties of a very formidable kind.

[1] *Obst. Trans.* vol. viii.

It is pretty generally assumed by authors that the children are necessarily premature, and therefore of small size, and that delivery before the full term is rather the rule than the exception. Dugés states that the children are often dead, and that putrefaction has taken place, which facilitates their expulsion. Both these assumptions seem to me to have been made without sufficient authority, and not to be borne out by the recorded facts. In only 1 of the 31 cases it is mentioned that the children were premature ; nor is there any sufficient reason that I can see why labour should commence before the full term of gestation.

By far the greatest number are included in the first class —that in which the bodies are nearly separate, but united by some part of the thorax or abdomen. This is the division which includes the celebrated Siamese Twins, an account of whose birth, I may observe, I have not been able to discover.[1] Out of the 31 cases, 19 come under this heading. The details of the labour are briefly as follows :—1 died undelivered ; 8 were terminated by the natural powers, in 3 of which the feet, and in 3 the head, presented ; in 2 the presentation is doubtful ; 6 were delivered by turning, or by traction on the lower extremities ; 4 were delivered instrumentally. *Class A.*

The details of the cases in which the feet presented, or in which turning was performed, clearly show that footling presentation was by far the most favourable, and it is fortunate that the feet often present naturally. The inference, of course, is, that version should be resorted to whenever any other presentation is met with in cases of double monstrosity of this type ; but, unfortunately, this rule could rarely be carried into execution, since we possess no means of diagnosing the junction of the fœtuses at a sufficiently early stage of labour to admit of turning being performed. It is only *Footling presentation is the most favourable.*

[1] The mother of these twins was a Chinese half-breed, short, and with a broad pelvis, and had borne several children previously. She stated on several occasions, in conversation with parties in Siam, that the twins were born reversed, the feet of one being followed by the head of the other, and that they were very small and feeble at birth and for several months afterwards. The twins confirmed this statement by affirming that they could, when little boys at play on the ground, turn themselves end for end upon the ensiform attachment up to the age of ten or twelve, the attachment being then soft and pliable.—Harris's note to second American edition.

under exceptionally favourable circumstances that this can be done; as, for example, in a case recorded by Molas,[1] in which both heads presented, but neither would enter the brim of the pelvis.

The chief difficulty is in the delivery of the heads. The great difficulty must, of course, be in the delivery of the heads, for in all the recorded cases, with one exception, the bodies have passed through the pelvis parallel to each other with comparative ease until the necks have appeared, and then, as a rule, they could be brought no further. It is clear that the remainder of the fœtuses could no longer pass simultaneously; and, were direct traction continued, the heads would be inextricably fixed above the brim. In accordance with the direction of the pelvic axes the posterior **Necessity of endeavouring to engage one head alone in the pelvic cavity.** head must first engage in the inlet; and, in order to effect this, it will be necessary to carry the bodies of the children well over the abdomen of the mother. This seems to be a point of primary importance. It would also be advisable to see that the bodies are made to pass through the pelvis with their backs in the oblique diameter. By this means more space is gained than if the backs were placed antero-posteriorly; while, at the same time, there is less chance of the heads hitching against the promontory of the sacrum and symphysis pubis, which otherwise would be very apt to occur.

Mode of delivery when the head presents. When the head presents, and the labour is terminated by the natural powers, delivery seems to be accomplished in one of two ways.

In the first and more common, the head and shoulders of one child are born, its breech and legs being subsequently pushed through the pelvis by a process similar to that of spontaneous evolution; and, afterwards, the second child probably passes footling without much difficulty.

Barkow relates a case in which *both* heads were delivered by the forceps, the bodies subsequently passing simultaneously. Two similar instances are recorded in the third and sixth volumes of the 'Obstetrical Transactions.' When delivery takes place in this manner, the head of the second child must fit into the cavity formed by the neck of the first, and the pelvis must necessarily be sufficiently roomy to admit of the expulsion of the head of the second child,

[1] *Mém. de l'Académie*, vol. i.

while its cavity is diminished in size by the presence of the neck and shoulders of the first. Either of these processes must obviously require exceptionally favourable conditions as regards the size of the child and the pelvis ; and the difficulty in the way of delivery must be much greater than when the lower extremities present. Therefore I think the rule should be laid down that, when the nature of the case is made out (and for the purpose of accurate diagnosis a complete examination under anæsthesia should be practised), turning should be performed, and the feet brought down.

In the event of its being found impossible to effect delivery after a considerable portion of the bodies is born, no resource remains but the mutilation of the body of one child, so as to admit of the passage of the other. This was found necessary in one case in which the children presented by the feet, and were born as far as the thorax, but could get no further. The body of the anterior child was removed by a circular incision as far as it had been expelled, which allowed the remaining portion, consisting of the head and shoulders, to re-enter the uterus : after this the posterior child was easily extracted, and the mutilated fœtus followed without difficulty. *Mutilation of the fœtuses.*

In class B, in which the children are united back to back, 3 cases are recorded, all of which were delivered by the natural powers. One of these is the case of Judith and Hélène, the celebrated Hungarian twins, who lived to the age of twenty. Hélène was born as far as the umbilicus, and, after the lapse of three hours, her breech and legs descended. Judith was expelled immediately afterwards, her feet descending first.[1] Exactly the same process occurred in a case described by M. Norman, the children being also born alive, and dying on the ninth day. *Class B.*

It is probable that labour is easier in this case of double monsters than in the former, because the children are so joined that there is no necessity for the bodies to be parallel to each other during birth when the head presents, and *Labour is easier than in class A.*

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[1] The celebrated Carolina twins, born July 11, 1851, and still living, were brought into the world by the same method, but the mother, having a large pelvis, ' had a brief and easy ' delivery. The larger of the two girls also came first, as in the Tzoni case of 1701. These twins are seven years older than the Hungarian sisters were at death.—Harris's note to third American edition.

after the birth of the head and shoulders of the first child, its breech and lower extremities are evidently pushed down and expelled by a process of spontaneous evolution. If the feet originally presented, the mechanism of delivery and the rules to be followed would be the same as in class A; but the difficulty would probably be greater, since the juncture is not so flexible, and a more complete parallelism of the bodies would be necessary during extraction.

Class C. In class C, that of the dicephalous monster, I have found the description of the birth of 8 cases, 3 of which were terminated by the natural powers. In two of these, the process of evolution was the main agent in delivery; one head being born and becoming fixed under the arch of the pubes, the body being subsequently pushed past it, and the second head following without difficulty. This process failing, the proper course is to decapitate the first-born head, and then bring down the feet of the child, when delivery can be accomplished with ease. This was the course adopted in 2 out of the 8 cases; and it may be done with the less hesitation since, from their structural peculiarities, it is extremely improbable that monsters of this kind should survive. In the third case, terminated naturally, the heads were said to have been born simultaneously, but it seems probable that the one head lay in the hollow formed by the neck of the other, and so rapidly followed it. If the feet presented, the case may be managed in the same manner as in class A.

Class D. Monstrosities of class D, in which the heads are united, the bodies being distinct, appear to be the most uncommon of all; and I can find the description of delivery in only 2 cases. One of these gave rise to great difficulty, the labour in the other was easy. We should scarcely anticipate much difficulty in the birth of monsters of this type; for, if the head presented and would not pass, we should naturally perform craniotomy; and if the bodies came first, the delivery of the monstrous head could readily be accomplished by perforation.

Result to the mothers. The result to the mothers in all these cases seems to have been very favourable. There is only one in which the death of the mother is recorded; and although in many the result is not mentioned, we may fairly assume that recovery took place.

Among difficulties in labour, some of the most important are due to morbid conditions of the fœtus itself.

Of these, the most common, as well as the most serious, is caused by intra-uterine hydrocephalus (giving rise to a collection of watery fluid within the cranium), by which the dimensions of the child's head are enormously increased, and the due relations between it and the pelvic cavity entirely destroyed (fig. 127).

Intra-uterine hydrocephalus.

Fortunately, this disease is of comparatively rare occurrence, for it is one of great gravity both as regards the mother and child. As regards the mother, the serious character of the complication is proved by the statistics of Dr.

Its danger both as regards the mother and child.

Fig. 127.
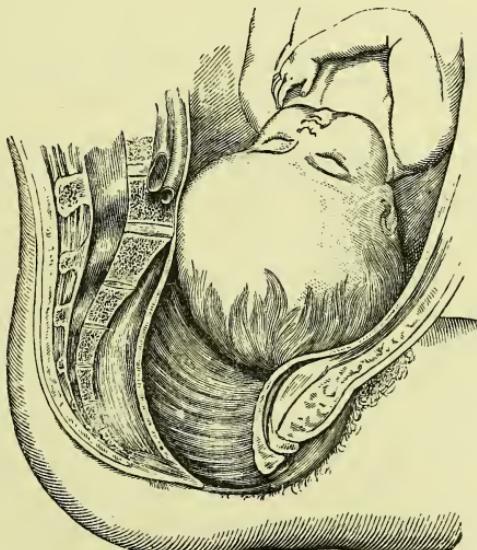
LABOUR IMPEDED BY HYDROCEPHALUS.

Keiller, of Edinburgh, who found that out of 74 cases no less than 16 were accompanied by rupture of the uterus. The reason of the danger to which the mother is subjected is obvious. In some few cases, indeed, the head is so compressible that, provided the amount of contained fluid be small, it may be sufficiently diminished in size, by the moulding to which it is subjected, to admit of its being squeezed through the pelvis. In the majority of cases, however, the size of the head is too great for this to occur. The uterus therefore exhausts itself, and may even rupture,

in the vain endeavour to overcome the obstacle; while the large and distended head presses firmly on the cervix, or on the pelvic tissues, if the os be dilated, and all the evil effects of prolonged compression are apt to follow.

Its dia-gnosis is not always easy. The diagnosis of intra-uterine hydrocephalus is by no means so easy as the description in obstetric works would lead us to believe. It is true that the head is much larger and more rounded in its contour than the healthy fœtal cranium, and also that the sutures and fontanelles are more wide, and admit occasionally of fluctuation being perceived through them. Still it is to be remembered that the head is always arrested above the brim, where it is consequently high up and difficult to reach, and where these peculiarities are made out with much difficulty. As a matter of fact, the true nature of the case is comparatively rarely discovered before delivery; thus Chaussier [1] found that in more than one half of the cases he collected an erroneous diagnosis had been made.

Method of diagnosis. Whenever we meet with a case in which either the history of previous labour, or a careful examination, convinces us that there is no obstacle due to pelvic deformity, in which the pains are strong and forcing, but in which the head persistently refuses to engage in the brim, we may fairly surmise the existence of hydrocephalus. Nothing, however, short of a careful examination under anæsthesia, the whole hand being passed into the vagina so as to explore the presenting part thoroughly, will enable us to be quite sure of the existence of this complication. Under these circumstances such a complete examination is not only justified but imperative; and, when it has been made, the difficulties of diagnosis are lessened, for then we may readily make out the large round mass, softer and more compressible than the healthy head, the widely separated sutures, and the fluctuating fontanelles.

Pelvic presenta-tions are frequently met with. In a considerable proportion of cases—as many, it is said, as 1 out of 5—the fœtus presents by the breech. The diagnosis is then still more difficult; for the labour progresses easily until the shoulders are born, when the head is completely arrested, and refuses to pass with any amount of

[1] *Gazette Médicale,* 1864.

traction that is brought to bear on it. Even the most careful examination may not enable us to make out the cause of the delay, for the finger will impinge on the comparatively firm base of the skull, and may be unable to reach the distended portion of the cranium. At this time abdominal palpation might throw some light on the case, for, the uterus being tightly contracted round the head, we might be able to make out its unusual dimensions. The wasted and shrivelled appearance of the child's body, which so often accompanies hydrocephalus, would also arouse suspicion as to the cause of delay. On the whole, such cases may be fairly assumed to be less dangerous to the mother than when the head presents : for, in the latter, the soft parts are apt to be subjected to prolonged pressure and contusion ; while, in the former, delay does not commence till after the shoulders are born, and then the character of the obstacle would be sooner discovered, and appropriate means earlier taken to overcome it.

The treatment is simple, and consists in tapping the head, so as to allow the cranial bones to collapse. There is the less objection to this course, since the disease almost necessarily precludes the hope of the child's surviving. The aspirator would draw off the fluid effectually, and would at least give the child a chance of life ; and, under certain circumstances, the birth of a child who lives for a short time only may be of extreme legal importance. More generally the perforator will be used, and as soon as it has penetrated a gush of fluid will at once verify the diagnosis. Schroeder recommends that, after perforation, turning should be performed, on account of the difficulty with which the flaccid head is propelled through the pelvis. This seems a very unnecessary complication of an already sufficiently troublesome case. As a rule, when once the fluid has been evacuated, the pains being strong, as they generally are, no delay need be apprehended. Should the head not come down, the cephalotribe may be applied, which takes a firmer grasp than the forceps, and enables the head to be crushed to a very small size and readily extracted. *Treatment.*

When the breech presents, the head must be perforated through the occipital bone, and generally this may be accomplished behind the ear without much difficulty. In a *Treatment when the breech presents.*

case of Tarnier's [1] the vertebral column was divided by a bistoury and an elastic male catheter introduced into the vertebral canal, through which the intracranial fluid escaped, the labour being terminated spontaneously. In any case in which it is found difficult to reach the skull with the perforator this procedure should certainly be tried.

Other forms of dropsical effusion.

Other forms of dropsical effusion may give rise to some difficulty, but by no means so serious. In a few rare cases the thorax has been so distended with fluid as to obstruct the passage of the child. Ascites is somewhat more common, and occasionally the child's bladder is so distended with urine as to prevent the birth of the body. The existence of any of these conditions is easily ascertained; for the head or breech, whichever happens to present, is delivered without difficulty, and then the rest of the body is arrested. This will naturally cause the practitioner to make a careful exploration, when the cause of the delay will be detected.

The treatment consists in the evacuation of the fluid by puncture. In the case of ascites, this should always be done, if possible, by a fine trocar or aspirator, so as not to injure the child. This is all the more important since it is impossible to distinguish a distended bladder from ascites, and an opening of any size into that viscus might prove fatal, whereas aspiration would do little or no harm, and would prove quite as efficacious.

Fœtal tumours obstructing delivery.

Certain fœtal tumours may occasion dystocia, such as malignant growths, or tumours of the kidney, liver, or spleen. Cases of this kind are recorded in most obstetric works. Hydro-encephalocele, or hydro-rachitis, depending on defective formation of the cranial or spinal bones, with the formation of a large protruding bag of fluid, is not very rare. The diagnosis of all such cases is somewhat obscure, nor is it possible to lay down any definite rules for their management, which must vary according to the particular exigencies. The tumours are rarely of sufficient size to prove formidable obstacles to delivery, and many of them are very compressible. This is specially the case with the spina bifida and similar cystic growths. Puncture, and in the more solid growths of the abdomen or thorax, evisceration, may be required.

[1] Hergott, *Maladies Fœtales qui peuvent faire obstacle à l'accouchement.* Paris, 1878.

Other deformities, such as the anencephalous fœtus, or Other congenital deformities. defective development of the thorax or abdominal parietes with protrusion of the viscera, are not likely to cause difficulty ; but they may much embarrass the diagnosis by the strange and unusual presentation that is felt. If, in any case of doubt, a full and careful examination be undertaken, introducing the whole hand if necessary, no serious mistake is likely to be made.

In addition to dystocia from morbid conditions of the Dystocia from excessive development of the fœtus. fœtus, difficulties may arise from its undue development, and especially from excessive size and advanced ossification of the skull. This last is especially likely to cause delay. Even the slight difference in size between the male and female head was found by Simpson to have an appreciable effect in increasing the difficulty of labour, when the statistics of a large number of cases were taken into account ; for he proved beyond doubt that the difficulties and casualties of labour occurred in decidedly larger proportion in male than in female births. Other circumstances, besides sex, have an important effect on the size of the child. Thus Duncan and Hecker have shown that it increases in proportion to the age of the mother and the frequency of the labours ; while the size of the parents has no doubt also an important bearing on the subject.

Although these influences modify the results of labour *en masse*, they have little or no practical bearing on any particular case, since it is impossible to estimate either the size of the head or the degree of its ossification until labour is advanced.

When labour is retarded by undue ossification or large Its treatment. size of the head, the cause must be treated on the same general principles which guide us when the want of proportion is caused by pelvic contraction. Hence, if delay arise, which the natural powers are insufficient to overcome, it will seldom happen that the disproportion is too great for the forceps to overcome. If we fail to deliver by it, no resource is left but perforation.

Large size of the body of the child is still more rarely a Large size of the body rarely causes delay. cause of difficulty, for, if the head be born, the compressible trunk will almost always follow. Still, a few authentic cases are on record, in which it was found impossible to extract

the fœtus on account of the unusual bulk of its shoulders and thorax. Should the body remain firmly impacted after the birth of the head, it is easy to assist its delivery by traction on the axillæ, by gently aiding the rotation of the shoulders into the antero-posterior diameter of the pelvic cavity, and, if necessary, by extracting the arms, so as to lessen the bulk of the part of the body contained in the pelvis. Hicks relates a case in which evisceration was required for no other apparent reason than the enormous size of the body. The necessity for any such extreme measure must, of course, be of the greatest possible rarity; and it is quite exceptional for difficulty from this source to be beyond the powers of nature to overcome.

CHAPTER XII.

DEFORMITIES OF THE PELVIS.

DEFORMITIES of the pelvis form one of the most important subjects of obstetric study, for from them arise some of the gravest difficulties and dangers connected with parturition. A knowledge, therefore, of their causes and effects, and of the best mode of detecting them, either during or before labour, is of paramount necessity; but the subject is far from easy, and it has been rendered more difficult than it need be, from over-anxiety on the part of obstetricians to force all varieties of pelvic deformities within the limits of their favourite classification. Importance of subject.

Many attempts in this direction have been made, some of which are based on the causes on which the deformities depend, others on the particular kind of deformity produced. The changes of form, however, are so various and irregular, and similar, or apparently similar, causes so constantly produce different effects, that all such endeavours have been more or less unsuccessful. For example, we find that rickets (of all causes of pelvic deformity the most important) generally produces a narrowing of the conjugate diameter of the brim; while the analogous disease, osteomalacia, occurring in adult life, generally produces contraction of the transverse diameter, with approximation of the pubic bones, and relative or actual elongation of the conjugate diameter. We might, therefore, be tempted to classify the results of these two diseases under separate heads, did we not find that, when rickets affects children who are running about, and subject to mechanical influences similar to those acting upon patients suffering from osteomalacia, a form of pelvis is produced hardly distinguishable from that met with in the latter disease, which by some authors is described as the pseudo-osteomalacic. Difficulties of classification. Objections to classification depending on cause.

On the whole, therefore, the most simple, as well as the most scientific, classification is that which takes as its basis the particular seat and nature of the deformity. Let us first glance at the most common causes.

The key to the particular shape assumed by a deformed pelvis will be found in a knowledge of the circumstances which lead to its regular development and normal shape in a state of health. The changes produced may, almost invariably, be traced to the action of the same causes which produce a normal pelvis, but which, under certain diseased conditions of the bones or articulations, induce a more or less serious alteration in form. These have been already described in discussing the normal anatomy of the pelvis, and it will be remembered that they are chiefly the weight of the body, transmitted to the iliac bones through the sacro-iliac joints, and counter-pressure on these, acting through the acetabula. Sometimes they act in excess on bones which are healthy, but possibly smaller than usual, and the result may be the formation of certain abnormalities in the size of the various pelvic diameters. At other times they operate on bones which are softened and altered in texture by disease, and which, therefore, yield to the pressure far more than healthy bones.

The two diseases which chiefly operate in causing deformity are rickets and osteomalacia. Into the essential nature and symptomatology of these complaints it would be out of place to enter here; it may suffice to remind the reader that they are believed to be pathologically similar diseases, with the important practical distinction that the former occurs in early life before the bones are completely ossified, and that the latter is a disease of adults producing softening in bones that have been hardened and developed. This difference affords a ready explanation of the generally resulting varieties of pelvic deformity.

Rickets commences very early in life, sometimes, it is believed, even in utero. It rarely produces softening of the entire bones, and only in cases of very great severity of those parts of the bones that have been already ossified. The effects of the disease are principally apparent in the cartilaginous portions of the bones, in which osseous deposit has not yet taken place. The bones, therefore, are not subject

to uniform change, and this fact has an important influence in determining their shape.   Rickety children also have imperfect muscular development ; they do not run about in the same way as other children, they are often continuously in the recumbent or sitting postures, and thus the weight of the trunk is brought to bear, more than in a state of health, on the softened bones.   For the same reason counter-pressure through the acetabula is absent or comparatively slight. When, however, the disease occurs for the first time in children who are able to run about, the latter comes into operation, and modifies the amount and nature of the deformity.   It is to be observed that in rickety children the bones are not only altered in form from pressure, but are also imperfectly developed, and this materially modifies the deformity.   When ossific matter is deposited, the bones become hard and cease to bend under external influences, and retain for ever the altered shape they have assumed.

In osteomalacia, on the contrary, the already hardened bones become softened uniformly through all their textures, and thus the changes which are impressed upon them are much more regular, and more easily predicated.   It is, however, an infinitely less common cause of pelvic deformity than rickets, as is evidenced by the fact that in the Paris Maternity, in a period of sixteen years, 402 cases of deformity due to rickets occurred to 1 due to osteomalacia.[1]

Effects of osteomalacia.

The frequency of both diseases varies greatly in different countries, and under different circumstances.   Rickets is much more common amongst the poor of large cities, whose children are ill-fed, badly clothed, kept in a vitiated atmosphere, and subjected to unfavourable hygienic conditions. Deformities are, therefore, more common in them than in the more healthy children of the upper classes, or of the rural population.   The higher degrees of deformity, necessitating the Cæsarean section, or craniotomy, are in this country of extreme rarity ; while in certain districts on the Continent they seem to be so frequent that these ultimate resources of the obstetric art have to be constantly employed.

Their varying frequency.

In another class of cases the ordinary shape is modified by weight and counter-pressure operating on a pelvis in which one or more of the articulations is ossified.   In this

Effects of ossification of pelvic articulations.

[1] Stanesco, *Recherches Cliniques sur les Rétrécissements du Bassin.*

way we have produced the *obliquely ovate* pelvis of Naegele, or the still more uncommon *transversely contracted* pelvis of Robert.

Other causes of pelvic deformity.

A certain number of deformed pelves cannot be referred to a modification of the ordinary developmental changes of the bones. Amongst these are the deformities resulting from spondylolithesis, or downward dislocation of the lower lumbar vertebræ; from displacements of the sacrum, caused by curvatures of the spinal column, producing the kyphotic and scoliotic pelves; or from diseases of the pelvic bones themselves, such as tumours, malignant growths, and the like.

Equally enlarged pelvis.

The first class of deformed pelves to be considered is that in which the diameters are altered from the usual standard, without any definite distortion of the bones; and such are often mere congenital variations in size, from which no definite explanation can be given. Of this class is the pelvis which is equally enlarged in all its diameters (*pelvis æquabiliter justo major*), which is of no obstetric consequence, except inasmuch as it may lead to precipitate labour, and is not likely to be diagnosed during life.

Equally contracted pelvis.

The corresponding diminution of all the pelvic diameters (*pelvis æquabiliter justo minor*) may be met with in women who are apparently well-formed in every respect, and whose external conformation and previous history give no indication of the abnormality. Sometimes the diminution amounts to half an inch or more, and it can readily be understood that such a lessening in the capacity of the pelvis would give rise to serious difficulty in labour. Thus, in 3 cases recorded by Naegele a fatal result followed; in 2 after difficult instrumental delivery, and in the third after rupture of the uterus. The equally lessened pelvis, however, is of great rarity. An unusually small pelvis may be met with in connection with general small size, as in dwarfs. It does not necessarily follow, because a woman is a dwarf, that the pelvis is too small for parturition. On the contrary, many such women have borne children without difficulty.

The undeveloped pelvis.

In some cases a pelvis retains its infantile characteristics after puberty (fig. 128). The normal development of the pelvis has been interfered with, possibly from premature ossification of the different portions of the innominate bones, or from arrest of their growth from a weakly or rachitic con-

stitution. The measurements of these pelves are not always below the normal standard; they may continue to grow, although they have not developed. The proportionate measurements of the various diameters will then be as in the infant; and the antero-posterior diameter may be longer, or as long as the transverse, the ischia comparatively near each other, and the pubic arch narrow. Such a form of pelvis will interfere with the mechanism of delivery, and unusual difficulty in labour will be experienced. Difficulties from a similar cause may be expected in very young girls. Here, however, there is reason to hope that, as age advances, the pelvis will develop, and subsequent labours be more easy.

Fig. 128.
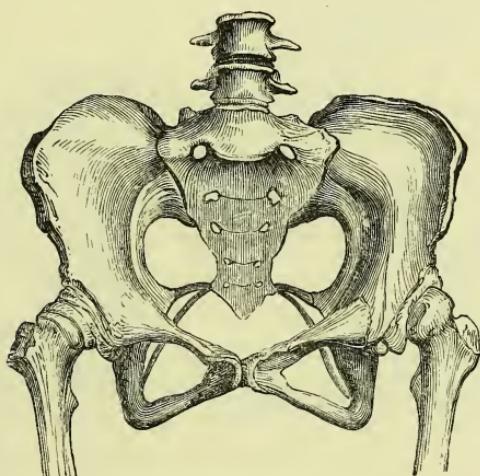
ADULT PELVIS RETAINING ITS INFANTILE TYPE.

The *masculine*, or funnel-shaped, pelvis owes its name to its approximation to the type of the male pelvis. The bones are thicker and stouter than usual, the conjugate diameter of the brim longer, and the whole cavity rendered deeper and narrower at its lower part by the nearness of the ischial tuberosities. It is generally met with in strong muscular women following laborious occupations, and Dr. Barnes, from his experience in the Royal Maternity Charity, says that it chiefly occurs in weavers in the neighbourhood of Bethnal Green, who spend most of their time in the sitting posture. 'The cause of this form of pelvis seems to be an advanced condition of ossification in a pelvis which would otherwise

Masculine, or funnel-shaped, pelvis.

have been *infantile*, brought about by the development of unusual muscularity, corresponding to the laborious employment of the individual.' The difficulties in labour will naturally be met with towards the outlet, where the funnel shape of the cavity is most apparent.

Contraction of conjugate diameter of brim. Diminution of the antero-posterior diameter (*flattened pelvis*) is most frequently limited to the brim, and is by far the most common variety of pelvic deformity. In its slighter degrees it is not necessarily dependent on rickets, although when more marked it almost invariably is so. When unconnected with rickets, it probably can be traced to some injurious influence before the bones have ossified, such as increased pressure of the trunk, from carrying weights in early childhood, and the like, By this means the sacrum is unduly depressed, and projects forward, so as to slightly narrow the conjugate diameter.

Mode of production in rickets. When caused by rickets the amount of the contraction varies greatly, sometimes being very slight, sometimes sufficient to prevent the passage of the child altogether, and necessitate craniotomy or the Cæsarean section. The sacrum, softened by the disease, is pressed vertically downwards by the weight of the body, its descent being partially resisted by the already ossified portions of the bone, so that the result is a downward and forward movement of the promontory. The upper portion of the sacral cavity is thus directed more backwards; but, as the apex of the bone is drawn forwards by the attachment of the perinæal muscles to the coccyx, and by the sacro-ischiatic ligaments, a sharp curve of its lower part in a forward direction is established. The horizontal rami of the pubes are also flattened, while the ischia are more widely separated than in a normal pelvis, thus producing a greater width of the pubic arch, while the acetabula are turned forwards.

Occasional increase of transverse diameter. The depression of the sacral promontory would tend to produce strong traction, through the sacro-iliac ligaments, on the posterior end of the sacro-cotyloid beams, and thus induce expansion of the iliac bones, and consequent increase of the transverse diameter of the brim. So an unusual length of the transverse diameter is very often described as accompanying this deformity, but probably it is not so often apparent as might otherwise be expected, on account of the

imperfect development of the bones generally accompanying rickets; and Barnes [1] says that in the parts of London where deformities are most rife, any enlargement of the transverse diameter is exceedingly rare.

Frequently the sacrum is not only depressed, but displaced more or less to one side, most generally to the left, thus interfering with the regular shape of the deformed brim. This is often the result of a lateral flexion of the spinal coloumn, depending on the rachitic diathesis, and when well marked is known as the *scolio-rachitic pelvis*

The scolio-rachitic and scoliotic pelvis.

Fig. 129.
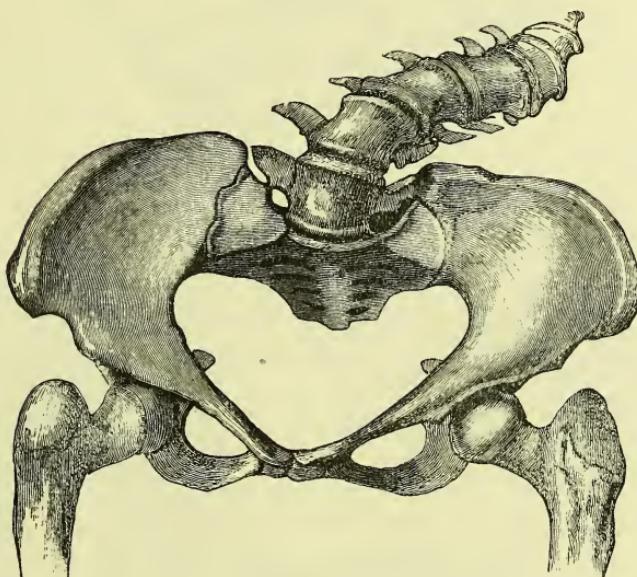
SCOLIO-RACHITIC PELVIS.
(From a specimen in the Museum of St. Bartholomew's Hospital.)

(fig. 129), in which one side of the pelvis, that corresponding to the direction of the pelvic curve, is asymmetrical and contracted, the ilio-pectineal line being sharply curved inwards about the site of the sacro-iliac synchondrosis, the symphysis pubis being displaced towards the opposite side. A somewhat similar, but much less marked, unilateral asymmetry may exist in cases of scoliosis unconnected with rickets, but rarely to a sufficient degree to interfere materially with labour.

In most cases of this kind the cavity of the pelvis is

[1] *Lectures on Obst. Operations*, p. 280.

not diminished in size, and is often even more than usually
wide. The constant pressure on the ischia, which the sit-
ting posture of the child entails, tends to force them apart,
and also to widen the pubic arch. Considerable advantage
results from this in cases in which we have to perform

Fig. 130.
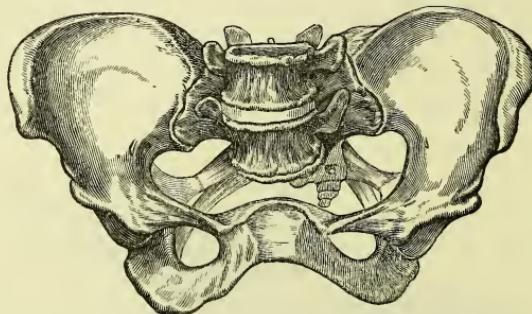
RICKETY PELVIS, WITH BACKWARD DEPRESSION OF SYMPHYSIS PUBIS.

obstetric operations, as it gives plenty of room for mani-
pulation.

In a few exceptional cases the narrowing of the conjugate
diameter is increased by a backward depression of the sym-
physis pubis, which gives the pelvic brim a sort of figure-
of-eight shape (fig. 130). The most reasonable explanation

Fig. 131.
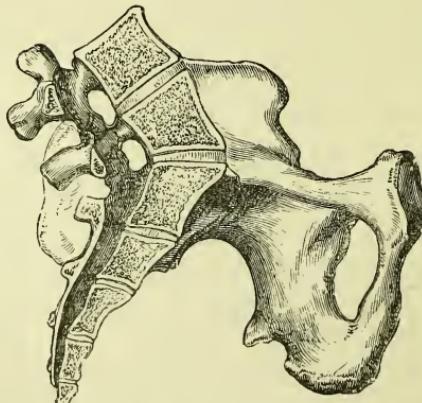
FLATNESS OF SACRUM WITH NARROWING OF PELVIC CAVITY.

of this peculiarity seems to be, that it is the result of the
muscular contraction of the recti muscles, at their point of

attachment, when the centre of gravity of the body is thrown backwards, on account of the projection of the sacral promontory. Sometimes also the antero-posterior diameter of the cavity is unusually lessened by the disappearance of the vertical curvature of the sacrum, which, instead of forming a distinct cavity, is nearly flat (fig. 131).

In a few rare cases, to which attention was first called in 1853 by Kilian of Bonn, a very formidable narrowing of the conjugate diameter of the pelvic brim is produced by a downward displacement of the fourth and fifth lumbar vertebræ, which become dislocated forward, or, if not actually dislocated, at least separated from their several articulations to a sufficient extent to encroach very seriously on the dimensions of the pelvic inlet. This condition is known as *spondylolithesis* (fig. 132).

The effect of this is sufficiently obvious, for the projection

Spondylolithesis.

Fig. 132.
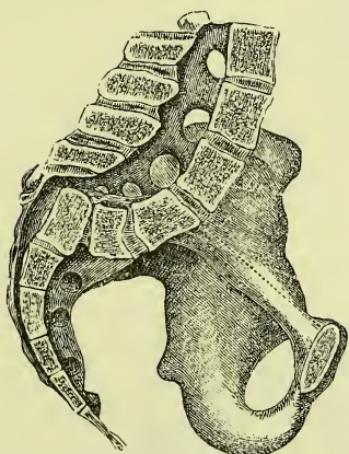
PELVIS DEFORMED BY SPONDYLOLITHESIS. (After Kilian.)

of the lumbar vertebræ prevents the passage of the child. To such an extent is obstruction thus produced, that, in the majority of the recorded cases, the Cæsarean section was necessary. The true conjugate diameter, that between the promontory of the sacrum and the symphysis pubis, is increased rather than diminished; but, for all practical purposes, the condition is similar to extreme narrowing of the conjugate from rickets, for the bodies of the displaced vertebræ project into and obstruct the pelvic brim.

The cause of this deformity seems to be different in different cases. In some it seems to have been congenital, and in others to have depended on some antecedent disease of the bones, such as tuberculosis or scrofula, producing inflammation and softening of the connection between the last lumbar vertebra and the sacrum, thus permitting downward displacement of the bones. Lambl believed that it generally followed spina bifida, which had become partially

cured, but which had produced deformity of the vertebræ, and favoured their dislocation. Brodhurst,[1] on the other hand, thinks that it most probably depends on rachitic inflammation and softening of the osseous and ligamentous structures, and that it is not a dislocation in the strict sense of the word. This condition has recently been made the subject of special study by Dr. François Neugebauer,[2] who believes that the forward displacement is never the result of antecedent disease of the bones, but depends either on congenital want of development of the vertebral arches, or on traumatism, such as fracture of the articular processes, which allows the weight of the trunk to displace the body of the last lumbar vertebra forwards, either partially or entirely.

Spondylo-lizema.

A somewhat analogous deformity has been described by Hergott,[3] under the name of *spondylolizema*. In this the bodies of the lower lumbar vertebræ having been destroyed by caries, the upper lumbar vertebræ sink downwards and forwards, so as to obstruct the pelvic inlet, and prevent the engagement of the fœtus. It thus differs from spondylolithesis, in which there is dislocation, but not destruction, of the bodies of the lower lumbar vertebræ.

Narrowing of the oblique diameter.

The most marked examples of narrowing of both oblique diameters depend on osteomalacia. In this disease, as has already been remarked, the bones are uniformly softened, and the alterations in form are further influenced by the fact that the disease commences after union of the separate portions of the ossa innominata has been completely effected. The amount of deformity in the worst cases is very great, and frequently renders delivery impossible without the Cæsarean section. Sometimes the softening of the bones proves of service in delivery, by admitting of the dilatation of the contracted pelvic diameter by the pressure of the presenting part, or even by the hand. Some curious cases are on record in which the deformity was so great as to apparently require the Cæsarean section, but in which the softened bones eventually yielded sufficiently to render this unnecessary.

Deformity from osteo-malacia.

The weight of the body depresses the sacrum in a verti-

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[1] *Obst. Trans.* vol. vi. p. 97.
[2] *Contribution à la Pathogénie du Bassin vicié par le Glissement Vertébral.* Paris, 1884.   [3] *Arch. de Tocologie*, 1877.

cal direction, and at the same time compresses its component Mode of
parts together, so as to approximate the base and apex of the produc-
tion in
bone, and narrow the conjugate diameter of the brim, by osteo-
causing the promontory to encroach upon it.   The most malacia.

Fig. 133.
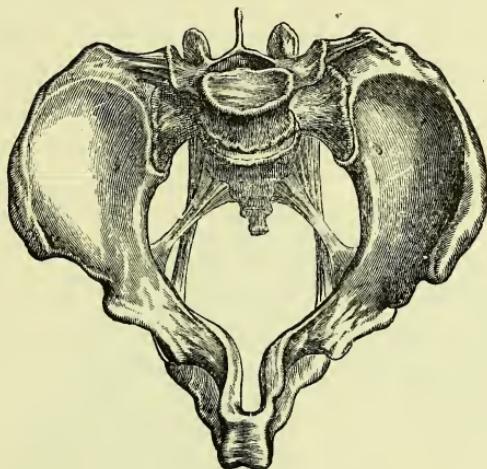
OSTEOMALACIC PELVIS.

characteristic changes are produced by the pushing inwards
of the walls of the pelvis at the cotyloid cavities, in conse-
quence of pressure exerted at these points through the femora.
The effect of this is to diminish both oblique diameters,

Fig. 134.
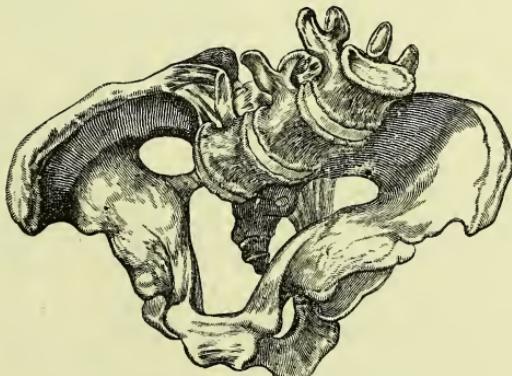
EXTREME DEGREE OF OSTEOMALACIC DEFORMITY.

giving the brim somewhat the shape of a trefoil, or an ace
of clubs.   The sides of the pubes are at the same time ap-
proximated, and may become almost parallel, and the true con-
jugate may be even lengthened (fig. 133).   The tuberosities

of the ischia are also compressed together, with the rest of the lateral pelvic wall, so that the outlet is greatly deformed as well as the brim (fig. 134).

Obliquely contracted pelvis. That form of deformity in which one oblique diameter only is lessened has received considerable attention, from having been made the subject of special study by Naegele, and is generally known as the *obliquely contracted pelvis* (fig. 135). It is a condition that is very rarely met with, although it is interesting from an obstetric point of view, as throwing considerable light on the mode in which the natural development of the pelvis is effected. It is difficult to diagnose, inasmuch as there is no apparent external deformity, and probably it has never, in fact, been detected before delivery. It has a very serious influence on labour; Litzmann found that out of 28 cases of this deformity, 22 died in their labours, and 5 more in subsequent deliveries. The prognosis, therefore, is very formidable, and renders a knowledge of this distortion, rare though it be, of importance.

Its essential characteristic is flattening and want of development of one side of the pelvis, associated with anchylosis of the corresponding sacro-iliac synchondrosis. The latter is probably always present, and it seems to be most generally a congenital malformation. The lateral half of the sacrum on the same side, and the entire innominate bone, are much atrophied. The promontory of the sacrum is directed towards the diseased side, and the symphysis pubis is pushed over towards the healthy side.

The main agent in the production of this deformity is the absence of the sacro-iliac joint, which prevents the proper lateral expansion of the pelvic brim on that side, and allows the counter-pressure through the femur to push in the atrophied os innominatum to a much greater extent than usual. The chief diminution in the length of the pelvic diameter is between the ilio-pectineal eminence of the affected side and

Fig. 135.
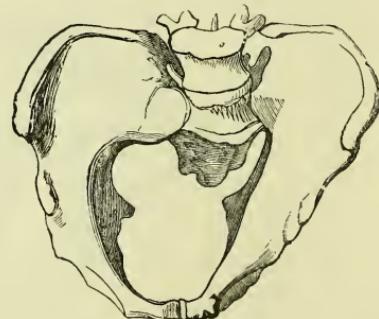
OBLIQUELY CONTRACTED PELVIS.
(After Duncan.)

the healthy sacro-iliac joint; while the oblique diameter between the anchylosed joint and the healthy os innominatum is of normal length.

Transverse contraction of the pelvic brim is very much less common than narrowing of the conjugate diameter. It most frequently depends on backward curvature of the lower parts of the spinal column, in consequence of disease of the vertebræ. This form of deformed pelvis is generally known as the *kyphotic* (fig. 136). The effect of the spinal curvature

Narrowing of the transverse diameter.

Kyphotic deformity.

Fig. 136.
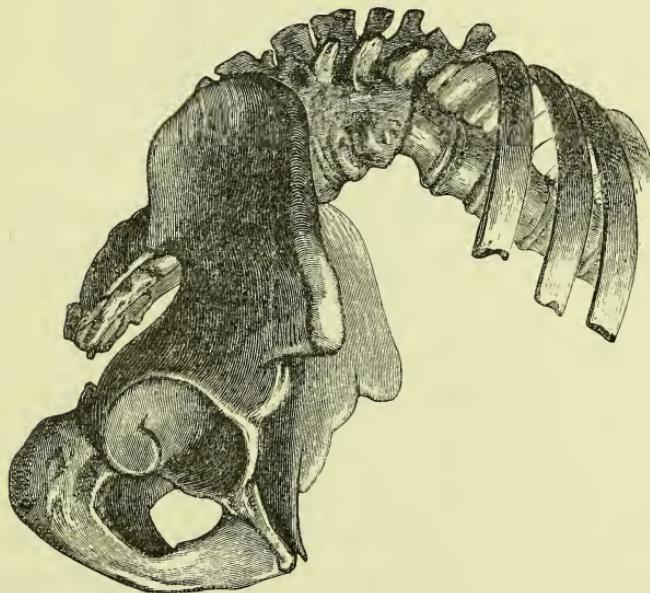
KYPHOTIC PELVIS.
(From a specimen in the Museum of St. Bartholomew's Hospital.)

is to drag the promontory of the sacrum backwards, so that it is high up and out of reach. By this means the antero-posterior diameter of the brim is increased, while the transverse is lessened; the relative proportion between the two is thus reversed. While the upper portion of the sacrum is displaced backwards, its lower end is projected forward, so that the antero-posterior diameters of the cavity and outlet are considerably diminished. The ischial tuberosities are also nearer to each other, and the pubic arch is narrowed. Obstruction to delivery will be chiefly met with at the lower parts and outlet of the pelvic cavity; for, although the transverse

diameter of the brim is narrowed, there is generally sufficient space for the passage of the head.

Robert's pelvis.

Another form of transversely contracted pelvis is known as *Robert's* pelvis (fig. 137), having been first discovered by Robert, of Coblentz. It is in fact a double obliquely contracted pelvis, depending on anchylosis of both sacro-iliac joints, and consequent defective development of the innominate bones. The shape of the pelvic brim is markedly oblong, and the sides of the pelvis are more or less parallel with each

Fig. 137.

ROBERT'S OR DOUBLE OBLIQUELY CONTRACTED PELVIS. (After Duncan.)

other. The outlet is also much contracted transversely. The amount of obstruction is very great, so that, according to Schroeder, out of 7 well-authenticated cases the Cæsarean section was required in 6.

Deformity from old-standing hip-joint disease.

Another cause of transverse deformity occasionally met with is luxation of the head of the femur, depending on old-standing joint-disease. The head of the femur, in this case, presses on the innominate bone at the site of dislocation, and the result is that the iliac fossa on the affected side, or both if the accident happens on both sides, is pushed inwards, the transverse diameter of the brim being lessened. The tuberosity of the ischium is, however, projected outwards, so that the outlet of the pelvis is increased rather than diminished.

Deformity from tumours, fractures, &c.

Obstruction of the pelvic cavity from exostoses or other forms of tumours growing from the bones is of great rarity (fig. 138). It may, however, produce very serious dystocia. Several curious examples are collected in Mr. Wood's article on the pelvis, in some of which the obstruction was so great as to necessitate the Cæsarean section. Some of these growths were true exostoses ; and, according to Stadfeldt,[1] these are commonly found in pelves that are otherwise contracted ; others, osteo-sarcomatous tumours attached to the

[1] *Obstetrical Journal*, July 1879.

pelvic bones, most generally the upper part of the sacrum; and others were malignant. In some cases spiculæ of bone have developed about the linea ilio-pectinea or other parts of the pelvis, which may not be sufficient to produce obstruction, but which may injure the uterus, or even the fœtal

Fig. 138.
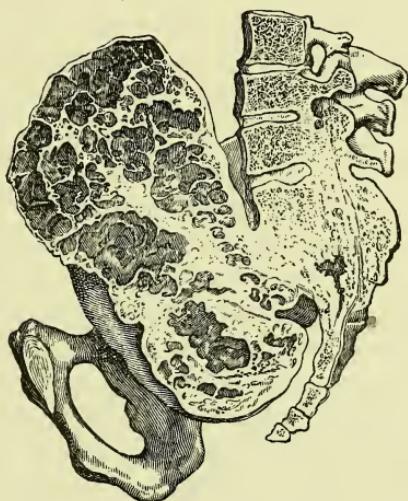
BONY GROWTH FROM SACRUM OBSTRUCTING THE PELVIC CAVITY.

head, when they are pressed upon them. Irregular projections may also arise from the callus of old fractures of the pelvic bones. All such cases defy classification, and differ so greatly in their extent, and in their effect on labour, that no rules can be laid down for them, and each must be treated on its own merits.

The effects of pelvic contractions on labour vary, of course, greatly with the amount and nature of the deformity; but they must always give rise to anxiety, and in the graver degrees they produce the most serious difficulties we have to contend with in the whole range of obstetrics. *Effects of contracted pelvis in labour.*

In the lesser degrees, in which the proportion between the presenting part and the pelvis is only slightly altered, we may observe little abnormal beyond a greater intensity of the pains, and some protraction of the labour. It is generally observed that the uterine contractions are strong and forcible in cases of this kind, probably because of the increased resistance they have to contend against; and this is obviously a *Nature of uterine action in pelvic deformity.*

desirable and conservative occurrence, which may, of itself, suffice to overcome the difficulty. The first stage, however, is not unfrequently prolonged, and the pains are ineffective, for the head does not readily engage in the brim, the uterus is more mobile than in ordinary labours, and it probably acts at a disadvantage.

Risk to the mother.

In the more serious cases, the mother is subjected to many risks, directly proportionate to the amount of obstruction and the length of the labour. The long-continued and excessive uterine action, produced by the vain endeavours to push the child through the contracted pelvic canal, the more or less prolonged contusion and injury to which the maternal soft parts are necessarily subjected (not unfrequently ending in inflammation and sloughing with all its attendant dangers), and the direct injury which may be inflicted by the measures we are compelled to adopt for aiding delivery (such as the forceps, turning, craniotomy, or Cæsarean section), all tend to make the prognosis a matter of grave anxiety.

Risk to the child.

Nor are the dangers less to the child; and a very large proportion of still-births will always be met with. The infantile mortality may be traced to a variety of causes, the most important being the protraction of the labour, and the continuous pressure to which the presenting part is subjected. For this reason, even in cases in which the contraction is so slight that the labour is terminated by the natural powers, it has been estimated that one out of every 5 children is still-born; and as the deformity increases in amount, so, of course, does the prognosis to the child become more unfavourable.

Frequent occurrence of prolapse of the cord.

Prolapse of the umbilical cord is of very frequent occurrence in cases of pelvic deformity, the tendency to this accident being traceable to the fact of the head not entering and occupying the upper strait of the pelvis as in ordinary labours, and thus leaving a space through which the cord may descend. So frequently is this complication met with in pelvic deformity that Stanesco found it had happened as often as 59 times in 414 labours; and when the dangers of prolapsed funis are added to those of protracted labours, it is hardly a matter of surprise that the occurrence should, under such circumstances, almost always prove fatal to the child.

The head of the child is also liable to injury of a more Injury to child's head. or less grave character from the compression to which it is subjected, especially by the promontory of the sacrum. Independently of the transient effects of undue pressure (temporary alteration of the shape of the bones and bruising of the scalp), there is often met with a more serious depression of the bones of the skull, produced by the sacral promontory. This is most marked in cases in which the head has been forcibly dragged past the projecting bone by the forceps, or after turning. The amount of depression varies with the degree of contraction; but sometimes, were it not for the yielding of the bones of the fœtal skull in this way, delivery, without lessening the size of the head by perforation, would be impossible. Such depressions are found at the spot immediately opposite the promontory, generally at the side of the skull near the junction of the frontal and parietal bones. Sometimes there is a slight permanent mark, but more often the depression disappears in a few days. The prognosis to the child is, however, grave, when the contraction has been sufficient to indent the skull; for it has been found that 50 per cent. of the children thus marked died either immediately or shortly after labour.[1]

The means which nature takes to overcome these diffi- Course of labour. culties are well worthy of study, and there are certain peculiarities in the mechanism of delivery, when pelvic deformities exist, which it is of importance to understand, as they guide us in determining the proper treatment to adopt.

Malpresentations of the fœtus are of much more frequent Frequency of malpresentation. occurrence than in ordinary labours; partly because the head does not engage readily in the brim, but, remaining free above it, is apt to be pushed away by the uterine contractions, and partly because of the frequent alteration of the axis of the uterine tumour. The pendulous condition of the abdomen in cases of pelvic deformity is often very obvious, so that the fundus is sometimes almost in a line with the cervix, and thus transverse or other abnormal positions are very frequently met with. It is to be noted, however, that we cannot regard breech presentations as so unfavourable as in ordinary labours, for the pressure from the contracted pelvis is less likely to be injurious when applied to the body

[1] Schroeder, *op. cit.* p. 256.

than to the head of the child ; and, indeed, as we shall presently see, the artificial production of these presentations is often advisable as a matter of choice.

Mechanism of delivery in head presentations.

The mode in which the head passes naturally through a contracted pelvis is in some respects different from the ordinary mechanism of delivery in head presentations, and has been carefully worked out by Spiegelberg and other German obstetricians.

The means which nature adopts to overcome the difficulty are different in cases in which there is a marked narrowing of the conjugate diameter of the brim, and in those in which there is a generally contracted pelvis.

a. In contracted brim.

In the former, and more common, deformity, the head lies at the brim with its long occipito-frontal diameter in the transverse diameter of the pelvis, and, as both parietal bones cannot enter the contracted brim, it lies with one parietal bone on a much lower level than the other, in the large majority of cases that nearest the pubes being most depressed, so that the sagittal suture is felt high up near the promontory of the sacrum. As labour advances, if the contraction is not too great to be insuperable, the anterior fontanelle comes much more within reach than in ordinary labour, while, at the same time, the occipital portion of the head is shoved to the side of the pelvis, so that its narrow bi-temporal diameter engages in the contracted conjugate. At this stage, on examination, it will be found—supposing we have to do with a case in which the occiput points to the left side of the pelvis—that the anterior fontanelle is lower than the posterior, and to the right, the bi-temporal diameter of the head is engaged in the conjugate diameter of the brim (as the smallest diameter of the skull, there is manifest advantage in this), and that the bi-parietal diameter and the largest portion of the head points to the left side. The sagittal suture will be felt running across in the transverse diameter of the brim, but nearer to the sacrum, the head being placed obliquely. As the head is forced down by the uterine contractions, the parietal bone, which is resting on the promontory, is pushed against it, so that the sagittal suture is forced more into the true transverse diameter of the pelvic brim, and approaches nearer to the pubes. The next step is the depression of the head, the occiput undergoing a sort of

rotation on its transverse axis so that it reaches a plane below the brim. When this is accomplished, the rest of the head readily passes the obstruction. The forehead now meets with the resistance of the pelvic walls, the posterior fontanelle descends to a lower level, and, as the cavity of the pelvis in cases of antero-posterior contraction of the brim is generally of normal dimensions, the rest of the labour is terminated in the usual way.

In the generally contracted pelvis the head enters the brim with the posterior fontanelle lowest, and it is after it has engaged in it that the resistance to its progress becomes manifest. The result is, therefore, an exaggeration of what is met with in ordinary cases. The resistance to the anterior or longer arm of the lever is greater than that to the occipital or shorter; and, therefore, the flexion of the head becomes very marked. The posterior fontanelle is consequently unusually depressed, and the anterior quite out of reach. So the head is forced down as a wedge, and its further progress must depend upon the amount of contraction. If this be not too great the anterior fontanelle eventually descends, and delivery is completed in the usual way. Should the contraction be too much to permit of this, the head becomes jammed in the pelvis, and diminution of its size may be essential. *b.* In generally contracted pelvis.

In cases of deformity of the conjugate diameter, combined with general contraction of the pelvis, the mechanism partakes of the peculiarities of both these classes, to a greater or less extent, in proportion to the preponderance of one or other species of deformity.

It rarely happens that deformities of the pelvis, except of the gravest kind, are suspected before labour has actually commenced, and, therefore, we are not often called upon to give an opinion as to the condition of the pelvis before delivery. Should we be so, there are various circumstances which may aid us in arriving at a correct conclusion. Prominent among them is the history of the patient in childhood. If she is known to have suffered from rickets in early life, more especially if the disease has left evident traces in deformities of the limbs, or in a dwarfed and stunted growth, or in curvature of the spine, there will be strong presumptive evidence of pelvic deformity; a markedly pendulous state of the abdomen may also tend to confirm the suspicion. Diagnosis.

Necessity of a careful examination of the pelvis.

Nothing short of a careful examination of the pelvis itself will, however, clear up the point with certainty; and, even by this means, to estimate the precise degree of deformity with accuracy requires considerable skill and practice. The ingenuity of practitioners has been much exercised—it might perhaps be justly said wasted—in the invention of various more or less complicated pelvimeters for aiding us in obtaining the desired object. It is, however, pretty generally admitted by all accoucheurs that the hand forms the best and most reliable instrument for this purpose, at any rate as regards the interior of the pelvis ; although a pair of callipers, such as Baudelocque's well-known instrument, is essential for accurately determining the external measurements. The objections to all internal pelvimeters, even those most simple in their construction, are their cost and complexity, and the impossibility of using them without pain or injury to the patient.

External measurements.

It was formerly thought that by measuring the distance between the spinous processes of the sacrum and the symphysis pubis, and subtracting from it what we judge to be the thickness of the bones and soft parts, we might arrive at an approximate estimate of the measurement of the conjugate diameter of the pelvic brim. It is now admitted that this method can never be depended on, and that, taken by itself, it is practically useless. A change in the relative length of other external measurements of the pelvis is, however, often of great value in showing the existence of deformity internally, although not in judging of its amount. The measurements which are used for this purpose are between the anterior superior spines of the ilia, and between the centres of their crests, averaging respectively 10 and 11 inches. According to Spiegelberg, these measurements may give one of three results.

1. Both may be less than they ought to be, but the relation of one to the other remains unchanged.

2. That between the crests is not, or is at most very little, diminished, but that between the spines is increased.

3. Both are diminished, but at the same time their mutual relation is not normal, the distance between the spines being as long, if not longer, than that between the crests.

No. 1 denotes a uniformly contracted pelvis; No. 2, a pelvis simply contracted in the conjugate diameter of the brim, and not otherwise deformed; No. 3, a pelvis with narrowed conjugate and also uniformly contracted, as in the severe type of rachitic deformity. If, however, both these measurements are of average length, and the distance between the crests is about one inch greater than between the spines, the pelvis is normal.

Besides the above, some information may be obtained by the measurement of the external conjugate diameter, which averages $7\frac{3}{4}$ inches. This may be taken by placing one point of the callipers in the depression below the spine of the last lumbar vertebra, the other at the centre of the upper edge of the symphysis pubis. If the measurement be distinctly below the average, not more, for example, than 6·3 in., we may conclude that there is a narrowing of the antero-posterior diameter of the brim, the extent of which we must endeavour to ascertain by other means.

For the purpose of making these measurements, Baudelocque's *compas d'épaisseur* can be used, or Dr. Lazarewitch's elegant universal pelvimeter, which can be adopted also for internal pelvimetry; but, in the absence of these special contrivances, an ordinary pair of callipers, such as are used by carpenters, can be made to answer the desired object.

These external measurements must be corroborated by internal, chiefly of the antero-posterior diameter, by which alone we can estimate the amount of the deformity. We endeavour to find, in the first place, the length of the inclined conjugate, between the lower edge of the symphysis pubis and the promontory of the sacrum, which averages about half an inch more than the true conjugate. This is best done by placing the patient on her back, with the hips well raised. The index finger of the right hand is then introduced into the vagina, and the perinæum is pressed steadily backwards, so as to overcome the resistance it offers. If the tip of the finger can reach the promontory of the sacrum, its radial side is raised so as to touch the lower edge of the pubes. A mark is made with the nail of the index of the left hand on that part of the examining finger which rests under the symphysis, and then the distance from this to the tip of the finger, less half an inch, may be taken to

Internal measurements.

indicate the measurement of the true conjugate of the brim.
Various pelvimeters have been devised to make the same
measurements, such as Lumley Earle's, Lazarewitch's, which
is similar in principle, and Van Huevel's; the best and sim-
plest, I think, is that invented by Dr. Greenhalgh (fig. 139).
It consists of a movable rod, attached to the flexible band of
metal which passes around the palm of the examining hand.
At the distal end of the rod is a curved portion, which
passes over the radial edge of the index finger. The exami-
nation is made in the usual way, and when the point of the

Fig. 139.
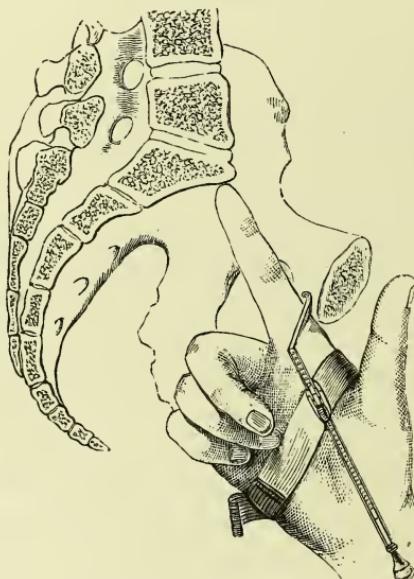
GREENHALGH'S PELVIMETER.

finger is resting on the promontory of the sacrum the rod is
withdrawn until it is arrested by the posterior surface of the
symphysis, the exact measurement of the inclined conjugate
being then read off the scale.

It is to be remembered that this procedure is useless in
the slighter degrees of contraction, in which the promontory
of the sacrum cannot be easily reached. Dr. Ramsbotham
proposed to measure the conjugate by spreading out the
index and middle fingers internally, the tip of one resting
on the promontory, the other behind the symphysis pubis;
and then drawing them, in the same position, and measuring

the distance between them.   This manœuvre I believe to be impracticable.

Whenever, in actual labour, we wish to ascertain the condition of the pelvis accurately, the patient should be anæsthetised, and the whole hand introduced into the vagina (which could not otherwise be done without causing great pain), and the proportions of the pelvis, and the relations of the head to it, thoroughly explored ; and, if what has been said as to the mechanism of delivery in these cases be borne in mind, this may aid us in determining the kind of deformity existing.   In this way contractions about the outlet of the pelvis can also be pretty generally made out.

The obliquely contracted pelvis cannot be determined by any of these methods, but certain external measurements, as Naegele has pointed out, will readily enable us to recognise its existence.   It will be found that measurements which in the healthy pelvis ought to be equal are unequal in the obliquely distorted pelvis.   The points of measurement are chiefly : (1) From the tuberosity of the ischium on one side to the posterior superior spine of the ilium on the other; (2) From the anterior superior iliac spine on the one side to the posterior superior on the opposite ; (3) From the trochanter major of one side to the posterior superior iliac spine on the other; (4) From the lower edge of the symphysis pubis to the posterior superior iliac spine on either side ; (5) From the spinous process of the last lumbar vertebra to the anterior superior spine of the ilium on either side. *Mode of diagnosing the oblique pelvis.*

If these measurements differ from each other by half an inch to an inch, the existence of an obliquely deformed pelvis may be safely diagnosed.   The diagnosis can be corroborated by placing the patient in the erect position, and letting fall two plumb-lines, one from the spines of the sacrum, the other from the symphysis pubis.   In a healthy pelvis these will fall in the same plane, but in the oblique pelvis the anterior line will deviate considerably towards the unaffected side.

The proper management of labour in contracted pelvis is, even up to this time, one of the most vexed questions in midwifery, notwithstanding the immense amount of discussion to which it has given rise ; and the varying opinions of accoucheurs of equal experience afford a strong proof of the *Treatment.*

difficulties surrounding the subject. This remark applies, of course, only to the lesser degree of deformity, in which the birth of a living child is not hopeless. When the antero-posterior diameter of the brim measures from $2\frac{3}{4}$ to 3 inches, it is universally admitted that the destruction of the child is inevitable, unless the pelvis be so small as to necessitate the performance of the Cæsarean section. But when it is between 3 inches and the normal measurement, the comparative merits of the forceps, turning, and the induction of prema-ture labour form a fruitful theme for discussion. With one class of accoucheurs the forceps is chiefly advocated, and turning admitted as an occasional resource when it has failed; and this indeed, speaking broadly, may be said to have been the general view held in this country. More recently we find German authorities of eminence, such as Schroeder and Spiegelberg, giving turning the chief place, and condemning the forceps altogether in contracted pelvis, or at least restricting its use within very narrow limits. More strangely still we find, of late, that the induction of premature labour, on the origination and extension of which British accoucheurs have always prided themselves, is placed without the pale, and spoken of as injurious and useless in reference to pelvic deformities. To see our way clearly amongst so many conflicting opinions is by no means an easy task, and perhaps we may best aid in its accomplishment by considering separately the three operations in so far as they bear on this subject, and pointing out briefly what can be said for and against each of them.

The forceps.

In England and in France it is pretty generally admitted that in the slighter degrees of contraction the most reliable means of aiding the patient is by the forceps. It should be remembered that the operation, under such circumstances, is always much more serious than in ordinary labours simply delayed from uterine inertia, when there is ample room, and the head is in the cavity of the pelvis; for the blades have to be passed up very high, often when the head is more or less movable above the brim, and much more traction is likely to be required. For these reasons artificial assistance, when pelvic deformity is suspected, is not to be lightly or hurriedly resorted to. Nor, fortunately, is it always necessary, for if the pains be sufficiently strong, and the contraction

not too great to prevent the head engaging at all, after a lapse of time it will become so moulded in the brim as to pass even a considerable obstruction. In all cases, therefore, sufficient time must be given for this; and if no suspicious symptoms exist on the part of the mother—no elevation of temperature, dryness of the vagina, rapid pulse, and the like, and the fœtal heart sounds continue to be normal—labour may be allowed to go on for some hours after the rupture of the membranes, so as to give nature a chance of completing the delivery. When this seems hopeless, the intervention of art is called for. *Time should be given to test the natural powers.*

The forceps is generally considered to be applicable in all degrees of contraction, from the standard measurement down to about $3\frac{1}{4}$ inches in the conjugate of the brim. There can be no doubt that in such cases traction with the forceps often enables us to effect delivery, when the natural efforts have proved insufficient, and holds out a very fair hope of saving the child. Out of 17 cases in which the high forceps operation was resorted to for pelvic deformity, reported by Stanesco, in 13 living children were born. If the length of the labour, and the long-continued compression to which the child has been subjected, be borne in mind, this result must be considered very favourable. *Cases suitable for the forceps.*

What are the objections which have been brought against the operation? These have been principally made by Schroeder and other German writers. They are, chiefly, the difficulty of passing the instrument; the risk of injuring the maternal structures; and the supposition that, as the blades must seize the head by the forehead and occiput, their compressive action will diminish its longitudinal and increase its transverse diameter (which is opposed to the contracted part of the brim), and so enlarge the head just where it ought to be smallest. There is little doubt that these writers much exaggerate the compressive power of the forceps. Certainly, with those generally used in this country, any disadvantage likely to accrue from this is more than counterbalanced by the traction on the head; and the fact that minor degrees of obstruction can be thus overcome, with safety both to the mother and child, is abundantly proved by the numberless cases in which the forceps has been used. *Objections that have been raised to the forceps.*

It is very likely that the forceps does not act equally well

in all cases. When the head is loose above the brim; when the contraction is chiefly limited to the antero-posterior diameter, and there is abundance of room at the sides of the pelvis for the occiput to occupy after version; and when, as is. usual in these cases, the anterior fontanelle is depressed and the head lies transversely across the brim, it is probable that turning may be the safer operation for the mother, and the easier performed. When, on the other hand, the head has engaged in the brim, and has become more or less impacted, it is obvious that version could not be performed without pushing it back, which may be neither easy nor safe. In the generally contracted pelvis, in which the head enters in an exaggerated state of flexion and lies obliquely, the posterior fontanelle being much depressed, the forceps is more suitable.

Fig. 140.

SECTION OF FŒTAL CRANIUM, SHOWING ITS CONICAL FORM.

Fig. 141.

The special reasons why version sometimes succeeds when the forceps fails, or why it may be elected from the first as a matter of choice, have been by no one better pointed out than by Sir James Simpson. Although the operation was performed by many of the older obstetricians,
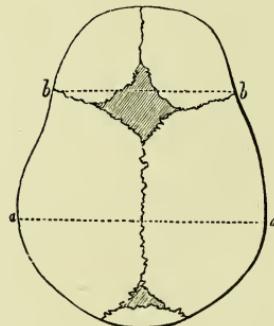
SHOWING THE GREATER BREADTH OF THE BI-PARIETAL DIAMETER OF THE FŒTAL CRANIUM. (After Simpson.)

its revival in modern times, and the clear enunciation of its principles, can undoubtedly be traced to his writings. He points out that the head of the child is shaped like a cone, its narrowest portion the base of the cranium (fig. 140, *b b*), measuring, on an average, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch less than the broadest portion (fig. 140, *a a*), viz. the bi-parietal diameter. In ordinary head presentations the latter part of the head has to pass first: but if the feet are brought down, the narrow apex of the cranial cone is brought first into apposition with the contracted brim, and can be more easily *drawn* through than the broader base can be *pushed* through

by the uterine contractions.   Nor is this the only advantage,
for after turning the narrower bi-temporal diameter (fig.
141, *b b*)—which measures, on an average, half an inch less
than the bi-parietal (fig. 141, *a a*)—is brought into contact
with the contracted conjugate, while the broader bi-parietal
lies in the comparatively wide space at the side of the pelvis
(fig. 142).   These mechanical considerations are sufficiently

Fig. 142.
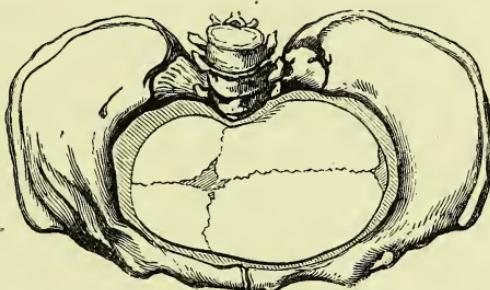
SHOWING THE GREATER SPACE FOR THE BI-PARIETAL DIAMETER AT THE SIDE OF
THE PELVIS IN CERTAIN CASES OF DEFORMITY.   (After Simpson.)

obvious, and fully explain the success which has often at-
tended the performance of the operation.

It is generally admitted that it may be possible, for the Limits
reasons just mentioned, to deliver a living child by turning of the
through a pelvis contracted beyond the point which would operation.
permit of a living child being extracted by the forceps.
Many obstetricians believe that it is possible to deliver a
living child by turning in a pelvis contracted even to the
extent of $2\frac{3}{4}$ inches in the conjugate diameter.   Barnes
maintains that, although an unusually compressible head
may be drawn through a pelvis contracted to 3 inches, the
chance of the child being born alive under such circum-
stances must necessarily be small, and that from $3\frac{1}{4}$ inches
to the normal size must be taken as the proper limits of the
operation.

That delivery is often possible by turning, after the for- It fre-
ceps and the natural powers have failed, and when no other quently
resource is left but the destruction of the child, must, I think, succeeds
be admitted by all ; for the records of obstetrics are full of when the
such cases.   To take one example only, Dr. Braxton Hicks[1] forceps
has failed.

[1] *Guy's Hospital Reports*, 1870.

records four cases in which the forceps were tried unsuc-
cessfully, in all of which version was used, three of the
children being born alive.   Here are the lives of three chil-
dren rescued from destruction, within a short period, in the
practice of one man ; and a fact like this would of itself
be ample justification of the attempt to deliver by turning,
when the child was known to be alive, and other means had
failed.   The possibility that craniotomy may still be required
is no argument against the operation ; for although perfora-
tion of the after-coming head is certainly not so easy as
perforation of a presenting head, it is not so much more
difficult as to justify the neglect of an experiment by which
it may possibly be altogether avoided.

Compara-
tive esti-
mate of
the two
opera-
tions.

The original choice of turning is a more difficult question
to decide.   The most generally received opinion in the pre-
sent day amongst scientific obstetricians is that in the simply
flattened pelvis, with an antero-posterior diameter of not
less than $2\frac{3}{4}$ inches, turning is the preferable operation.   In
every case of doubt it is desirable thoroughly to anæsthetise
the patient, and make a careful examination with the whole
hand in the vagina.   If we find the sagittal suture lying
transversely, one parietal bone on a lower line than the other,
and if both fontanelles are easily within reach, and some space
exists at the sides of the pelvis beside the forehead and occi-
put, then turning is the procedure most likely to succeed,
and the descent of the head after version can be very ma-
terially assisted by strong pressure applied from above by
an assistant, as has been well pointed out by Goodell.[1]   If,
on the other hand, the anterior fontanelle is high up, and
out of reach, the head being distinctly flexed, we have to do
with a generally contracted pelvis, and the forceps is the
preferable operation.

Cases in
which cra-
niotomy
or the
Cæsarean
section is
required.
The in-
duction of
premature
labour.

When the contraction is below 3 inches in the conju-
gate, or when the forceps and turning have failed, no resource
is left but the destruction of the fœtus, or the Cæsarean
section.

The induction of premature labour as a means of avoiding
the risks of delivery at term, and of possibly saving the life
of the child, must now be studied.   The established rule
in this country is, that in all cases of pelvic deformity, the

[1] *Amer. Journ. of Obstet.* vol. viii.

existence of which has been ascertained either by the experience of former labours or by accurate examination of the pelvis, labour should be induced previous to the full period, so that the smaller and more compressible head of the premature fœtus may pass where that of the fœtus at term could not. The gain is a double one, partly the lessened risk to the mother, and partly the chance of saving the child's life.

The practice is so thoroughly recognised as a conservative and judicious one that it might be deemed unnecessary to argue in its favour, were it not that some eminent authorities have of late years tried to show that it is better and safer to the mother to leave the labour to come on at term ; and that the risk to the child is so great in artificially induced labour as to lead to the conclusion that the operations should be altogether abandoned, except, perhaps, in the extreme distortion in which the Cæsarean section might otherwise be necessary. Prominent amongst those who hold these views are Spiegelberg and Litzmann, and they have been supported, in a modified form, by Matthews Duncan. Spiegelberg[1] tries to show, by a collection of cases from various sources, that the results of induced labour in contracted pelvis are much more unfavourable than when the cases are left to nature ; that in the latter the mortality of the mothers is 6·6 per cent., and of the children 28·7 per cent., whereas in the former the maternal deaths are 15 per cent., and the infantile 66·9 per cent. Litzmann[2] arrives at not very dissimilar results— namely, 6·9 per cent. of the mothers and 20·3 per cent. of the children in contracted pelvis at term, and 14·7 per cent. of the mothers and 55·8 per cent. of the children, in artificially induced premature labour.

If these statistics were reliable, inasmuch as they show a very decided risk to the mother, there might be great force in the argument that it would be better to leave the cases to run the chance of delivery at term. It is, however, very questionable whether they can be taken, in themselves, as being sufficient to settle the question. The fallacy of determining such points by a mass of heterogeneous cases, collected together without a careful sifting of their histories,

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[1] _Arch. f. Gyn._ b. i. s. 1.　　　　　　[2] _Ib._ b. ii. s. 169.

has over and over again been pointed out; and it would be easy enough to meet them by an equal catalogue of cases in which the maternal mortality is almost nil. The results of the practice of many authorities are given in Churchill's work, where we find, for example, that out of 46 cases of Merriman's, not one proved fatal. The same fortunate result happened in 62 cases of Ramsbotham's. His conclusion is that 'there is undoubtedly some risk incurred by the mother, but not more than by accidental premature labour,' and this conclusion, as regards the mother, is that which has long ago been arrived at by the majority of British obstetricians, who undoubtedly have more experience of the operation than those of any other nation. With regard to the child, even if the German statistics be taken as reliable, they would hardly be accepted as contra-indicating the operation, inasmuch as it is intended to save the mother from the dangers of the more serious labour at term, and, in many cases, to give at least a chance to the child, whose life would otherwise be certainly sacrificed. The result, moreover, must depend to a great extent on the method of operation adopted, for many of the plans of inducing labour recommended are certainly, in themselves, not devoid of danger both to the mother and the child. It may, I think, be admitted, as Duncan contends,[1] that the operation has been more often performed than is absolutely necessary, and that the higher degrees of pelvic contraction are much more uncommon than has been supposed to be the case. That is a very valid reason for insisting on a careful and accurate diagnosis, but not for rejecting an operation which has so long been an established and favourite resource.

Determination of period for inducing labour.
When the induction of labour has been determined on, the precise period at which it should be resorted to becomes a question for anxious consideration, since the longer it is delayed the greater, of course, are the dangers for the child. Many tables have been constructed to guide us on this point, which are not, on the whole, of so much service as they might appear to be, on account of the difficulty of determining with minute accuracy the amount of contraction. The following, however, which is drawn up by Kiwisch, may serve for a guide in settling this question :—

[1] *Edin. Med. Journ.* July 1873, p. 339.

		Inches		Lines				
When the sacro-pubic diameter is		2	and	6 or	7	induce labour at	30th	week.
,,	,,	2	,,	8 ,,	9	,,	,,	31st	,,
,,	,,	2	,,	10 ,,	11	,,	,,	32nd	,,
,,	,,	3	,,	—		,,	,,	33rd	,,
,,	,,	3	,,	1		,,	,,	33rd	,,
,,	,,	3	,,	2 ,,	3	,,	,,	34th	,,
,,	,,	3	,,	4 ,,	5	,,	,,	35th	,,
,,	,,	3	,,	5 ,,	6	,,	,,	36th	,,

In cases of moderate deformity, when labour pains have been induced, the further progress of the case may be left to nature; but in more marked cases, as in those below 3 inches, it will often be found necessary to assist delivery by turning or by the forceps, the former being here specially useful, on account of the extreme pliability of the head, and the facility with which it may be drawn through the contracted brim. By thus combining the two operations it may be quite possible to secure the birth of a living child even in pelves very considerably deformed.

When the contraction is so great as to necessitate the induction of the labour before the sixth month, or, in other words, before the child has reached a viable age, it would be preferable to resort to a very early production of abortion. The operation is then indicated, not for the sake of the child, but to save the mother from the deadly risk to which she would otherwise be subjected. As in these cases the mother alone is concerned, the operation should be performed as soon as we have positively determined the existence of pregnancy. No object can be gained by waiting until the development of the child is advanced to any extent, and the less the fœtus is developed, the less will be the pain and risks the mother has to undergo. There is no amount of deformity, however great, in which we could not succeed in bringing on miscarriage by some of the numerous means at our disposal; and, in spite of Dr. Radford's objections, who maintains that the obstetrician is not justified in sacrificing the life of a human being more than once, when the mother knows that she cannot give birth to a viable child, there are few practitioners who would not deem it their duty to spare the mother the terrible dangers of the Cæsarean section.

Production of abortion in extreme deformity.

CHAPTER XIII.

HÆMORRHAGE BEFORE DELIVERY : PLACENTA PRÆVIA.

THE hæmorrhages which are the result of an abnormal situation of the placenta, partially or entirely, over the internal os uteri, have formed a most fruitful theme for discussion. The explanation of the abnormal placental site, the sources of the blood, and the causes of its escape, the means adopted by nature for its arrest, and the proper treatment, have, each and all of them, been the subject of endless controversies, which are not yet by any means settled. It must be admitted, too, that the extreme importance of the subject amply justifies the attention which has been paid to it; for there is no obstetric complication more apt to produce sudden and alarming effects, and none requiring more prompt and scientific treatment.

Definition.   By *placenta prævia* we mean the insertion of the placenta at the lower segment of the uterine cavity, so that a portion of it is situated, wholly or partially, over the internal os uteri. In the former case there is *complete* or *central* placental presentation, in the latter an *incomplete* or *marginal* presentation.

Causes.   The causes of this abnormal placental site are not fully understood. It was supposed by Tyler Smith to depend on the ovule not having been impregnated until it had reached the lower part of the uterine cavity. Cazeaux suggests that the uterine mucous membrane is less swollen and turgid than when impregnation occurs at the more ordinary place, and that, therefore, it offers less obstruction to the descent of the ovule to the lower part of the uterine cavity. An abnormal size, or unusual shape, of the uterine cavity may also favour the descent of the impregnated ovule; the former probably explains the fact, that placenta prævia more generally occurs

in women who have already borne children.   Müller believes
that it results from uterine contractions occurring shortly
after conception, which force the ovum down to the lower
part of the uterine cavity.   These are merely interesting spe-
culations having no practical value, the fact being undoubted
that, in a not inconsiderable number of cases—estimated by
Johnson and Sinclair as 1 out of 573—the placenta is grafted
partially or entirely over the uterine orifice, although it is
now generally admitted that the placenta is never attached to
any portion of the cervix itself.

Placenta prævia was not unknown to the older writers, History.
who believed that the placenta had originally been situated
at the fundus, from which it had accidentally fallen to the
lower part of the uterus.   Portal, Levret, Roederer, and
especially our own countryman Rigby, were among those
whose observations tended to improve the state of obstetrical
knowledge as to its real nature.   To Rigby we owe the term
' *unavoidable hæmorrhage*,' as a synonym for placenta prævia,
and as distinguishing hæmorrhage from this source from that
resulting from separation of the placenta at its more usual
position, termed by him, in contra-distinction, ' *accidental
hæmorrhage.*'   These names, adopted by most writers on the
subject, are obviously misleading, as they assume an essential
distinction in the etiology of the hæmorrhage in the two
classes of cases, which is not always warranted.

It is of the utmost importance to a right understanding
of the nature and treatment of placenta prævia that we
should fully understand the source of the hæmorrhage, and
the manner of its production ; but we shall be able to discuss
this subject better after a description of the symptoms.

Although the placenta must occupy its unusual site from Sym-
the earliest period of its formation, it rarely gives rise to ptoms.
appreciable symptoms before the last three months of utero-
gestation.   It is far from unlikely, however, that such an
abnormal situation of the placenta may produce abortion in
the earlier months, the site of its attachment passing un-
observed.

The earliest symptom which causes suspicion is the Sudden
sudden occurrence of hæmorrhage, without any appreciable flow of
cause.   The amount of blood lost varies considerably.   In blood.
some cases the first hæmorrhage is comparatively slight, and

is soon spontaneously arrested; but, if the case be left to itself, the flow after a lapse of time—it may be a few days, or it may be weeks—again commences in the same unexpected way, and each successive hæmorrhage is more profuse. The losses show themselves at different periods. They rarely begin before the end of the sixth month, more often nearer the full period, and sometimes not until labour has actually commenced. The hæmorrhage is said, but this is doubtful, to often coincide with what would have been a menstrual period; possibly on account of the physiological congestion of the uterine organs then present. Should the first loss not show itself until at or near the full time, it may be tremendous, and a few moments may suffice to place the patient's life in jeopardy. Indeed, it may be safely accepted as an axiom, that once hæmorrhage has occurred, the patient is never safe; for excessive losses may occur at any moment without warning, and when assistance is not at hand. It often happens that premature labour comes on after one or more hæmorrhages.

Frequent unexpected recurrence of the hæmorrhage.

In any case of placenta prævia, when labour has commenced, whether premature or at the full time, the hæmorrhage may become excessive, and with each pain fresh portions of placenta may be detached, and fresh vessels torn and left open. Under these circumstances the blood often escapes in greater quantity with each successive pain, and diminishes in the interval. This has long been looked upon as a diagnostic mark by which we can distinguish between the so-called ' unavoidable ' and ' accidental ' hæmorrhage; in the latter the flow being arrested during the pains. The distinction, however, is altogether fallacious. The tendency of uterine contraction in placenta prævia, as in all other forms of uterine hæmorrhage, is to constrict the vessels from which the blood escapes, and so to lessen the flow. The apparently increased flow during the pains depends on the pains forcing out blood which has already escaped from the vessels. In one way up to a certain point, the pains do favour hæmorrhage, by detaching fresh portions of placenta; but the actual loss takes place chiefly during the intervals, and not during the continuance of contraction.

Blood generally escapes more profusely with each pain.

Explanation of this fact.

On vaginal examination, if the os be sufficiently open to admit the finger, which it generally is on account of the

relaxation produced by the loss of blood, we shall almost Results of always be able to feel some portion of presenting placenta. vaginal examina- If it be a central implantation, we shall find the aper- tion. ture of the cervix entirely covered by a thick, boggy mass which is to be distinguished from a coagulum by its consistence, and by its not breaking down under the pressure of the finger. Through the placental mass we may feel the presenting part of the fœtus; but not as distinctly as when there is no intervening substance. In partial placental presentations the bag of membranes, and above it the head or other presentation, will be found to occupy a part of the circle of the os, the rest being covered by the edge of the placenta. In marginal presentations we may only be able to make out the thickened edge of the after-birth, projecting at the rim of the os. If the cervix be high, and the gestation not advanced to term, these points may not be easy to make out, on account of the difficulty of reaching the cervix; and, as accurate diagnosis is of the utmost importance, it is proper to introduce two fingers, or even the whole hand, so as thoroughly to explore the condition of the parts. The lower portion of the uterine ovoid may be observed to be more than usually thick and fleshy; and Gendrin has pointed out that ballottement cannot be made out. The accuracy of our diagnosis may be confirmed, in doubtful cases, by finding that the placental bruit is heard over the lower part of the uterine tumour.

Dr. Wallace [1] has suggested that vaginal auscultation may be serviceable in diagnosis, and states that, by means of a curved wooden stethoscope, the placental bruit may be heard with startling distinctness. This is, however, a manœuvre that can hardly be generally carried out in actual practice.

It is now generally admitted by authorities that the im- The mediate source of the hæmorrhage is the lacerated utero- source of placental vessels. Only a few years ago Sir James Simpson rhage. advocated, with his usual energy, the theory, sustained by his predecessor, Dr. Hamilton, that the chief, if not the only, source of hæmorrhage was the detached portion of the placenta itself. He argued that the blood flowed from the portion of the placenta which was still adherent into that

[1] *Edin. Med. Journ.* Nov. 1872.

which was separated, and escaped from the surface of the latter; and on this supposition he based his practice of entirely separating the placenta, having observed that, in many cases in which the after-birth had been expelled before the child, the hæmorrhage had ceased. The fact of the cessation of the hæmorrhage, when this occurs, is not doubted; but Simpson's explanation is contested by most modern writers, prominent among whom is Barnes, who has devoted much study to the elucidation of the subject. He points out that the stoppage of the hæmorrhage is not due to the separation of the placenta, but to the preceding or accompanying contraction of the uterus, which seals up the bleeding vessels, just as it does in other forms of hæmorrhage. The site of the loss was actually demonstrated by the late Dr. Mackenzie in a series of experiments, in which he partially detached the placenta in pregnant bitches, and found that the blood flowed from the walls of the uterus, and not from the detached surface of the placenta. The arrangement of the large venous sinuses, opening as they do on the uterine mucous membrane, favours the escape of blood when they are torn across; and it is from them, possibly to some extent also from the uterine arteries, that the blood comes, just as in post-partum hæmorrhage, when the whole, instead of a part, of the placental site is bared.

Causes of hæmor-rhage.

Various explanations have been given of the causes of the hæmorrhage. For long it was supposed to depend on the gradual expansion of the cervix during the latter months of pregnancy, which separated the abnormally placed placenta. It has been seen, however, that this shortening of the cervix is apparent only, and that the cervical canal is not taken up into the uterine cavity during gestation, or, at all events, only during the last week or so. This, therefore, cannot be admitted as an explanation of placental separation. Jacquemier proposed another theory, which has been adopted by Cazeaux. He maintains that during the first six months of utero-gestation the superior portion of the uterus is more especially developed, as shown by the pyriform shape of the fundus during the time; and that, as the placenta is usually attached in that situation, and then attains its maximum of development, its relations to its attachments are undisturbed. During the last three months of pregnancy, on the contrary,

Theory of Jacquemier.

the lower segment of the uterus develops more than the upper, while the placenta remains nearly stationary in size ; the inevitable result being a loss of proportion between the cervix and the placenta, and the detachment of the latter. There are various objections which can be brought against this theory ; the most important being that there is no evidence at all to show that the lower segment of the uterus does expand more in proportion than the upper during the latter months of pregnancy. Barnes's theory is based on the supposition that the loss of relation between the uterus and placenta is caused by excess of growth on the part of the placenta itself over that of the cervix, which is not adapted for its attachment. The placenta, on this hypothesis, grows away from the site of its attachment, and hæmorrhage results. It will be observed that neither this theory nor that propounded by Jacquemier is readily reconcilable with the fact that hæmorrhage frequently does not begin until labour has commenced at term. Inasmuch as the loss of relation between the placenta and its attachments, which they both pre-suppose, must exist in every case of placenta prævia, hæmorrhage should always occur during some part of the last three months of pregnancy. Matthews Duncan [1] has recently investigated the whole subject at length, and maintains that the hæmorrhages are accidental, not unavoidable, being due to causes precisely similar to those which give rise to the occasional hæmorrhages when the placenta is normally placed. The abnormal situation of the placenta of course renders these causes more apt to operate ; but in their action he believes them to be precisely similar to those of accidental hæmorrhage, properly so called. Separation of the placenta from expansion of the cervix he believes to be the cause of hæmorrhage after labour has begun, and then it may strictly be called unavoidable : but hæmorrhage is comparatively seldom so produced during the continuance of pregnancy. 'There are,' says Duncan, ' four ways in which this kind of hæmorrhage may occur :—

Theory of Barnes.

Theory of Matthews Duncan.

' 1. By the rupture of a utero-placental vessel at or about the internal os uteri.

' 2. By the rupture of a marginal utero-placental sinus

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[1] *Edin. Med. Journ.* Nov. 1873, and *Brit. Med. Journ.* Nov. 1873.

within the area of spontaneous premature detachment, when the placenta is inserted not centrally or covering the internal os, but with a margin at or near the internal os.

' 3. By partial separation of the placenta from accidental causes, such as a jerk or fall.

' 4. By a partial separation of the placenta, the consequence of uterine pains producing a small amount of dilatation of the internal os. Such cases may be otherwise described as instances of miscarriage commencing, but arrested at a very early stage.'

I see no reason to doubt the possibility of hæmorrhage being due, in many cases, to the first three causes, and in its production it would strictly resemble accidental hæmorrhage. The fourth heading refers the hæmorrhage to partial separation, in consequence of commencing dilatation of the cervix, but it explains the dilatation by the supposition of commencing miscarriage. This latter hypothesis seems to be as needless as those which pre-suppose a want of relation between the placenta and its attachments. We know that, quite independently of commencing miscarriage, uterine contractions are constantly occurring during the continuance of pregnancy. There is no reason to suppose that these contractions do not affect the cervical as well as the fundal portions of the uterus; and in cases in which the placenta is situated partially or entirely over the os, one or more stronger contractions than usual may, at any moment, produce laceration of the placental attachments in that neighbourhood.

Pathological changes in the placenta.

A careful examination of the placenta may show pathological changes at the site of separation, such as have been described by Gendrin, Simpson, and other writers. They probably consist of thromboses in the placental cotyledons, and effused blood-clots, variously altered and decolourised, according to the lapse of time since separation took place. Changes occur in the portion of the placenta overlying the os uteri, whether separation has occurred or not. There may be atrophy of the placental structure in this situation, as well as changes of form, such as complete or partial separation into two lobes, the junction of which overlies the os uteri.[1]

Natural termination when

The history of delivery, if left to nature, is specially worthy of study, as guiding to proper rules of treatment.

[1] Sinelius, *Arch. Gén. de Méd.* vol. ii. 1861.

It sometimes happens, when the pains are very strong and the delivery rapid, that labour is completed without any hæmorrhage of consequence. 'Although,' says Cazeaux, 'hæmorrhage is usually considered to be inevitable under such circumstances, yet it may not appear even during the labour; and the dilatation of the os uteri may be effected without the loss of a drop of blood.' Again, Simpson conclusively showed that, when the placenta was expelled before the birth of the child, all hæmorrhage ceased. *the placenta presents.*

Barnes's theory of placenta prævia, which has been pretty generally adopted, explains satisfactorily both these classes of cases.

He describes the uterine cavity as divisible into three zones or regions. When the placenta is situated in the upper or middle of these zones, no separation or hæmorrhage need occur during labour. When, however, it is situated partially or entirely in the lower or cervical zone, the expansion of the cervix during labour must produce more or less separation, and consequent loss of blood. As soon as the previous portion of the placenta is sufficiently separated, provided contraction of the uterine tissue be present to seal up the mouths of the vessels, hæmorrhage no longer takes place. The placenta may not be entirely detached, but no further hæmorrhage occurs, in consequence of the remaining portion being engrafted on the uterus beyond the region of unsafe attachment. *Barnes's theory.*

In the former, then, of these classes of cases, the absence of hæmorrhage is explained on this theory, by the pains being sufficiently rapid and strong to complete the separation of the placental attachment from the lower cervical zone before flooding had taken place; in the latter, it ceases, not necessarily because the entire placenta is expelled, but because of its detachment from the area of dangerous implantation.

The amount of cervical expansion required for this purpose varies in different cases. Dr. Duncan[1] estimates the limit of the spontaneous detaching area to be a circle of $4\frac{1}{2}$ inches diameter, and that, after the cervix has expanded to that extent, no further separation or hæmorrhage takes place. To admit of the passage of a full-sized head, Barnes estimates that expansion to about a circle of 6 inches diameter is neces-

[1] *Obst. Trans.* vol. xv.

sary; on the other hand, he has sometimes observed ' that the hæmorrhage has completely stopped when the os uteri opened to the size of the rim of a wine-glass, or even less.'

It will be seen then that in this, as in every other form of puerperal hæmorrhage, the tendency of uterine contraction is to check the hæmorrhage; and that, provided the pains are sufficiently energetic, nature may be capable of stopping the flooding without artificial aid. It is but rarely, however, that she can be trusted for the purpose; and we shall presently see that these theoretical views have an important practical bearing on the subject of treatment.

Prognosis. The prognosis to both the mother and child is certainly grave in all cases of placenta prævia. Read, in his treatise on placenta prævia, estimates the maternal mortality, from the statistics of a large number of cases, as 1 in $4\frac{1}{2}$ cases, and Churchill as 1 in 3. This is unquestionably too high an estimate, and based on statistics the accuracy of which cannot be relied on. The mortality will, of course, greatly depend on the treatment adopted. Doubtless, if cases were left to nature, the result would be quite as unfavourable as Read supposes. But if properly managed, much more successful results may safely be anticipated. Out of 67 cases recorded by Barnes, the deaths were 6, or 1 in 8·5. Under any circumstances the risks to the mother are very great. Churchill estimates that more than half the children are lost. The reasons for the great danger to the child are very obvious, subjected as it is to the risk of asphyxia from the loss of the maternal blood, and from its respiration being carried on during labour by a placenta which is only partially attached; many children also perish from prematurity, or from malpresentation.

Treatment. Whenever, in the latter months of pregnancy, a sudden hæmorrhage occurs, the possibility of placenta prævia will naturally suggest itself; and by a careful vaginal examination, which under such circumstances should always be insisted on, the existence of this complication will generally be readily ascertained. It is seldom that the os is not sufficiently dilated to enable us to satisfy ourselves whether the placenta is presenting.

Is it justifiable to allow the The first question that will arise is, Are we justified in temporising, using means to check the hæmorrhage, and

allowing the pregnancy to continue ? This is the course which has generally been recommended in works on mid- wifery. We are told to place the patient on a hard mattress, not to heat or overburden her with clothes, to keep her abso- lutely at rest, to have the room cool and well-aired, to apply cold cloths to the vulva and lower part of the abdomen, to administer cold and acidulated drinks in abundance, and to prescribe acetate of lead and opium, or gallic acid, on account of their supposed hæmostatic effect. Of late years the judi- ciousness of these recommendations has been strongly con- tested. Not long ago an interesting discussion took place at the Obstetrical Society of London,[1] on a paper in which Dr. Greenhalgh advised the immediate induction of labour in all cases of placenta prævia. No less than six metropolitan teachers of midwifery took part in it, and, although they differed in details, they all agreed as to the unadvisability of allowing pregnancy to progress when the existence of pla- centa prævia had been distinctly ascertained. The reasons for this course are obvious and unanswerable. The labour, indeed, very often comes on of its own accord; but should it not do so, the patient's life must be considered to be always in jeopardy until the case is terminated, for no one can be sure that most dangerous, or even fatal, flooding may not at any moment come on ; and the nearer to term the patient is, the greater the risk to which she is subjected. Nor is the safety of the child likely to be increased by delay. Provided it has arrived at a viable age, the chances of its being born alive may be said to be greater if pregnancy be terminated at once, than if repeated floodings occur. I think, therefore, that it may be safely laid down as an axiom, that no attempt should be made to prevent the termination of pregnancy. but that our treatment should rather contemplate its con- clusion as soon as possible. An exception may, however, be made to this rule when the hæmorrhage occurs for the first time before the seventh month of utero-gestation. The chances of the child surviving would then be very small, and if the hæmorrhage be not alarming, as at that early period is likely to be the case, the measures indicated above may be employed, in the hope of carrying on the pregnancy until there is a prospect of the patient being delivered of a living

[1] *Obst. Trans.* vol. vi. p. 188.

child.   But little benefit is likely to accrue from astringent
drugs.   Perfect rest in bed is more likely to be beneficial
than anything else ; and astringent vaginal pessaries, of
matico or perchloride of iron, might be used with advantage
as local hæmostatics.

<div style="float:left">Various
methods
of treat-
ment.</div>

When the period of pregnancy, or the urgency of the
case, determines us to forego any attempt at temporising,
there are various plans of treatment to be considered.   These
are chiefly—1. *Puncture of the membranes.*   2. *Plugging
the vagina.*   3. *Turning.*   4. *Partial or complete separa-
tion of the placenta.*   It will be well to consider in detail
the relative advantages of, and indications for, each of these.
It is seldom, however, that we can trust to any one *per se* ;
in most cases two or more are required to be used in com-
bination.

<div style="float:left">Puncture
of the
mem-
branes.</div>

1. Puncture of the membranes is recommended by Barnes
as the first measure to be adopted in all cases of placenta
prævia, sufficient to cause anxiety.   ' It is,' he says, ' the
most generally efficacious remedy, and it can always be
applied.'   The primary object gained is the increase of
uterine contraction, by the evacuation of the liquor amnii.
Although the first effect of this may be to increase the flow
of blood by further separation of the placenta, the flooding
can generally be commanded by plugging, until the os is
sufficiently dilated to permit the passage of the child.   As
a rule, there is no great difficulty in effecting the puncture,
especially if the placental presentation be only partial.   A
quill, or other suitable contrivance, guided by the examining
finger, is passed through the cervix, and pushed through the
membranes.   In complete placenta prævia it may not be
so easy to effect the evacuation of the liquor amnii ; and,
although many authorities advise the penetration of the
substance of the placenta itself, I am inclined to think that
it would be better to abandon the attempt, in such cases,
and trust to other methods of treatment.

The objections which have been raised to puncture of the
membranes are chiefly that it interferes with the gradual
dilatation of the os, and renders the operation of turning much
more difficult.   The os is not, however, so regularly dilated
by the bag of membranes in cases of placenta prævia as it
is in ordinary labours.   Moreover, as the cervical tissues are

generally relaxed by the hæmorrhage, the dilatation is easily effected.   Should we desire to dilate the os, preparatory to turning, we can readily do so by means of Barnes's bags, which act, at the same time, as an efficient plug.   The objections, therefore, are not so weighty as they might have been before these artificial dilators were used.   I am inclined, for these reasons, to agree with the recommendation that puncture of the membranes should be resorted to in all cases of placenta prævia.

2. Plugging of the vagina, or, still better, of the cavity of the cervix itself, is especially serviceable in cases in which the os is not sufficiently dilated to admit of turning, or of separation of the placenta, and in which the hæmorrhage still continues after the evacuation of the liquor amnii.   By means of this contrivance the escape of blood is effectually controlled.

Plugging of the vagina.

The best way of plugging is to introduce a sponge tent of sufficient size into the cervical canal, and to keep it *in situ* by a vaginal plug ; the best material for the latter, and the method of introduction, are described under the head of abortion (vol. i. p. 295).   The sponge tent not only controls the hæmorrhage more effectually than any other means, but is, at the same time, effecting dilatation of the cervix.   It cannot be left in many hours, on account of the irritation produced, and of the fœtor from accumulating vaginal discharges. As long as it is in position, we should carefully examine, from time to time, to see that no blood is oozing past it.   If preferred, a Barnes's bag may be used for the same purpose.

While the plug is *in situ*, other modes of exciting uterine action may be very advantageously employed, such as a firm abdominal bandage, occasional friction over the uterus, and repeated doses of ergot.   The last is specially recommended by Dr. Greenhalgh, who used, at the same time, a plug formed of an oblong india-rubber ball inflated with air, and covered with spongio-piline.

On the removal of the plug we may find that considerable dilatation has taken place, perhaps to a sufficient extent to admit of labour being safely concluded by the natural efforts. In that case we shall find that, although the pains continue, no fresh hæmorrhage occurs.   Should it do so, it will be necessary to adopt further measures.

3. Turning has long been considered *the* remedy *par ex-cellence* in placenta prævia; and it is of unquestionable value in suitable cases.   Much harm, however, has been done when it has been practised before the os was sufficiently dilated to admit of the passage of the hand, or when the patient was so exhausted by previous hæmorrhage as to be unable to bear the shock of the operation.   The records of many fatal cases in the practice of those who taught, as did the large majority of the older writers, that turning at all risks was essential, conclusively prove this assertion.

It is most likely to prove serviceable when, either at first, or after the use of the tampon, the os is sufficiently dilated to admit the hand, and when the strength of the patient is not much enfeebled.   If she have a small, feeble, and thready pulse, it is certainly inapplicable, unless all other methods of arresting the hæmorrhage have failed.   And, even then, it would be well to attempt to rally the patient from her exhausted state by stimulants, etc., before the operation is commenced.

Provided the placental presentation be partial, the opera-tion can be performed without difficulty in the usual way. In central implantation the passage of the hand may give rise to some difficulty.   Dr. Rigby recommends that it should be pushed through the substance of the placenta, until it reaches the uterine cavity.   It is hardly possible to conceive how this could be done without completely detaching the placenta, and still less to understand how the fœtus could be dragged through the aperture thus made.   It will be far better to pass the hand by the border of the placenta, separat-ing it as we do so; and, if we can ascertain to which side of the cervix it is least attached, that should be chosen for the purpose.   In all cases in which it is possible, turning by the bi-polar method should be preferred.   In cases of placenta prævia especially it offers many advantages.   The operation can be soon performed; complete dilatation of the os is not so necessary; and it involves less bruising of the cervix, which is likely to be specially dangerous.   When once a lower extremity has been brought within the os, the delivery need not be hurried.   The limb of the child forms a plug, which effectually prevents all further loss; and we may then safely wait until we can excite uterine contraction, and terminate

the labour with safety.   The results of this method of treating
placenta prævia have been excellent.   Hoffmeier relates 37
cases managed in this way with only 1 death, and Behm 35
with none.[1]   Fortunately, the relaxation of the uterus, which
is so often present, facilitates this manner of performing
version, and it can generally be successfully accomplished.
Should the case be one which is otherwise suitable for turn-
ing, and the requisite amount of dilatation of the cervix not
be present, the latter can generally be effected in the space
of an hour or more (while at the same time a further loss of
blood is effectually prevented) by the use of Barnes's bags.

4. Entire separation of the placenta was originally recom-
mended by Simpson in his well-known paper on the subject.
The reasons which induced him to recommend it have already
been stated.   It is a mistake to suppose, however, as is so
often done, that he intended to recommend it in all cases
alike.   This supposition he was always careful to deny.   He
advised it especially— *Separation of the placenta.*

1. When the child is dead.
2. When the child is not yet viable.
3. When the hæmorrhage is great and the os uteri is not
yet sufficiently dilated for safe turning.   This was the state
in 11 out of 39 cases (Lee).
4. When the pelvic passages are too small for safe and
easy turning.
5. When the mother is too exhausted to bear turning.
6. When the evacuation of the liquor amnii fails.
7. When the uterus is too firmly contracted for turning.[2]

These are very much the cases in which all modern
accoucheurs would exclude the operation of turning; and
it was especially when that was unsuitable that Simpson
advised extraction of the placenta.   As his theory of the
source of hæmorrhage is now almost universally disbelieved,
so has the practice based on it fallen into disuse, and it need
not be discussed at length.   It is very doubtful whether
the complete separation and extraction of the placenta was a
feasible operation; unquestionably it can be by no means so
easy as Simpson's writings would lead us to suppose.   The
introduction of the hand far enough to remove the placenta

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[1] *Ztschr. f. Geburt und Gynak.* vols. vii. and ix.
[2] *Selected Obst. Works*, p. 68.

in an exhausted patient would probably cause as much shock as the operation of turning itself ; and another very formidable objection to the procedure is the almost certain death of the child, if any time elapse between the separation of the placenta and the completion of delivery. The modification of this method, so strongly advocated by Barnes, is certainly much easier of application, and would appear to answer every purpose that Simpson's operation effected. It is impossible to describe it better than in Barnes's own words :[1]—

'*The operation is this :* Pass one or two fingers as far as they will go through the os uteri, the hand being passed into the vagina if necessary ; feeling the placenta, insinuate the finger between it and the uterine wall ; sweep the finger round in a circle so as to separate the placenta as far as the finger can reach ; if you feel the edge of the placenta, where the membranes begin, tear open the membranes carefully, especially if these have not been previously ruptured ; ascertain, if you can, what is the presentation of the child before withdrawing your hand. Commonly, some amount of retraction of the cervix takes place after the operation, and *often the hæmorrhage ceases.*'

It will be seen from what has been said, that no one rule of practice can be definitely laid down for all cases of placenta prævia. Our treatment in each individual case must be guided by the particular conditions that are present ; and, if only we bear in mind the natural history of the hæmorrhage, we may confidently expect a favourable termination.

Summary of rules for treatment.

It may be useful, in conclusion, to recapitulate the rules which have been laid down for treatment in the form of a series of propositions :—

I. Before the child has reached a viable age, temporise, provided the hæmorrhage be not excessive, until pregnancy has advanced sufficiently to afford a reasonable hope of saving the child. For this purpose the chief indication is absolute rest in bed, to which other accessory means of preventing hæmorrhage, such as cold, astringent pessaries, &c., may be added.

II. In hæmorrhage occurring after the seventh month of utero-gestation, no attempt should be made to prolong the pregnancy.

[1] *Obstet. Operations*, 2nd ed. p. 417.

III. In all cases in which it can be easily effected, the membranes should be ruptured. By this means uterine contractions are favoured and the bleeding vessels compressed.

IV. If the hæmorrhage be stopped, the case may be left to nature. If flooding continue, and the os be not sufficiently dilated to admit of the labour being readily terminated by turning, the os and the vagina should be carefully plugged, while uterine contractions are promoted by abdominal bandages, uterine compression, and ergot. The plug must not be left in beyond a few hours.

V. If, on removal of the plug, the os be sufficiently expanded, and the general condition of the patient be good, the labour may be terminated by turning, the bi-polar method being used if possible, and the lower extremity of the child will form a plug until delivery is completed. If the os be not open enough, it may be advantageously dilated by a Barnes's bag, which also acts as a plug.

VI. Instead of, or before resorting to, turning, the placenta may be separated around the site of its attachment to the cervix. This practice is specially to be preferred when the patient is much exhausted, and in a condition unfavourable for bearing the shock of turning.

CHAPTER XIV.

HÆMORRHAGE FROM SEPARATION OF A NORMALLY SITUATED PLACENTA.

Defini-
tion.

THIS is the form of hæmorrhage which is generally described in obstetric works as '*accidental*,' in contradistinction to the '*unavoidable*' hæmorrhage of placenta prævia. In discussing the latter, we have seen that the term 'accidental' is one that is apt to mislead, and that the causation of the hæmorrhage in placenta prævia is, in some cases at least, closely allied to that of the variety of hæmorrhage we are now considering.

When, from any cause, separation of a normally situated placenta occurs before delivery, more or less blood is necessarily effused from the ruptured utero-placental vessels, and the subsequent course of the case may be twofold. 1. The blood, or at least some part of it, may find its way between the membranes and the decidua, and escape from the os uteri. This constitutes the typical 'accidental' hæmorrhage of authors. 2. The blood may fail to find a passage externally, and may collect internally (see Plate IV.), giving rise to very serious symptoms, and even proving fatal, before the true nature of the case is recognised. Cases of this kind are by no means so rare as the small amount of attention paid to them by authors might lead us to suppose ; and, from the obscurity of the symptoms and difficulty of diagnosis, they merit special study. Dr. Goodell [1] has collected together no less than 106 instances in which this complication occurred.

Causes
and
pathology.

The causes of placental separation may be very various. In a large number of cases it has followed an accident or exertion (such as slipping down stairs, stretching, lifting heavy weights, and the like), which has probably had the

[1] *Amer. Journ. of Obst.* vol. ii.

PLATE IV.

Placental site

Blood clot

Placental site {

Placenta attached to wall producing its inversion

Posterior wall of uterus

Anterior wall of uterus.

Membranes

Placenta

Retro-placental blood-clot
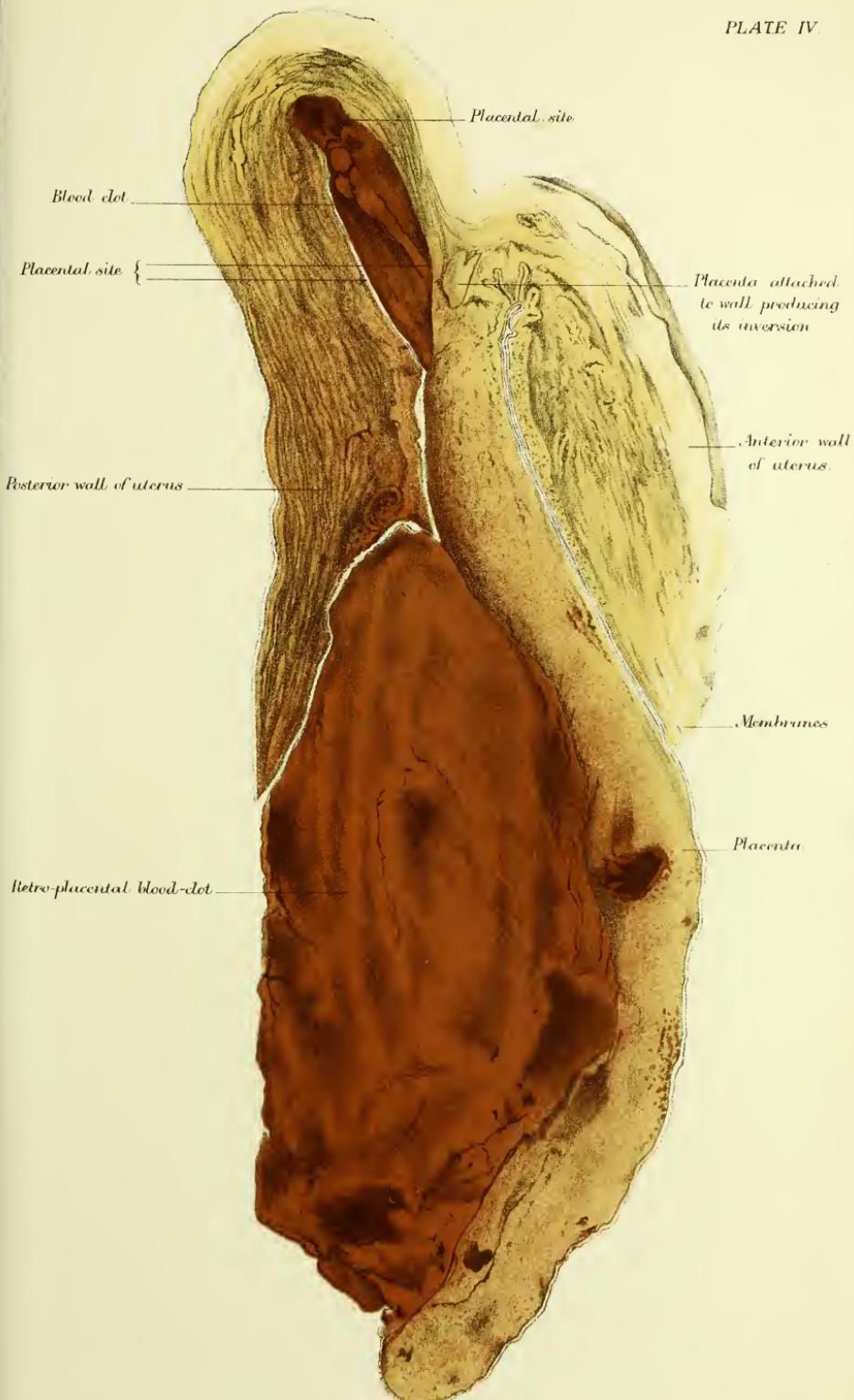
VERTICAL MESIAL SECTION OF UTERUS WITH PLACENTA PARTIALLY ATTACHED
from a case of abdominal section for hæmorrhage during labour. — after Barbour.

Mintern Bros. lith.

effect of lacerating some of the placental attachments.   At
other times it has occurred without such appreciable cause,
and then it has been referred to some change in the uterus,
such as a more than usually strong contraction producing
separation, or some accidental determination of blood causing
a slight extravasation between the placenta and the uterine
wall, the irritation of which leads to contraction and further
detachment.   Causes such as these, which are of frequent
occurrence, will not produce detachment except in women
otherwise predisposed to it.   It generally is met with in
women who have borne many children, more especially in
those of weakly constitution and impaired health, and rarely
in primiparæ.   Certain constitutional states probably pre-
dispose to it, such as albuminuria, or exaggerated anæmia;
and, still more so, degenerations and diseases of the placenta
itself.

This form of hæmorrhage rarely occurs to an alarming
extent until the latter months of pregnancy, often not until
labour has commenced.   The great size of the placental
vessels in advanced pregnancy affords a reasonable explana-
tion of this fact.

If, after separation of a portion of the placenta, the Sym-
blood finds its way between the membranes and the decidua, ptoms and
its escape per vaginam, even although in small amount, at diagnosis.
once attracts attention, and reveals the nature of the acci-
dent.   It is otherwise when we have to do with a case of
concealed hæmorrhage, the diagnosis of which is often a
matter of difficulty.   Then the blood probably at first
collects between the uterus and the placenta.   Sometimes
marginal separation does not occur, and large blood-clots are
formed in this situation, and retained there.   More often
the margin of the placenta separates, and the blood collects
between the membranes and the uterine wall, either towards
the cervix, where the presenting part of the child may pre-
vent its escape, or near the fundus.   In the latter case
especially, the coagula are apt to cause very painful stretch-
ing and distension of the uterus.   The blood may also find
its way into the amniotic cavity, but more frequently it does
not do so; probably, as Goodell has pointed out, because,
' should the os uteri be closed, the membranes, however
delicate, cannot, other things being equal, rupture any

sooner from the uterine walls, for the sum of the resistance
of the enclosed liquor amnii being equally distributed exactly
counterbalances the sum of the pressure exerted by the
effusion.' This point is of some practical importance,
because, after rupture of the membranes, the liquor amnii
is frequently found untinged with blood, and this might lead
us to suppose ourselves mistaken in our diagnosis, if this fact
were not borne in mind.

The most prominent symptoms in concealed internal
hæmorrhage are extreme collapse and exhaustion, for which
no adequate cause can be assigned. These differ from those
of ordinary syncope, with which they might be confounded,
chiefly in their persistence and severity, and in the presence
of the symptoms attending severe loss of blood, such as cold-
ness and pallor of the surface, great restlessness and anxiety,
rapid and sighing respiration, yawning, feeble, quick, and
compressible pulse. When there is severe internal, with
slight external hæmorrhage, we may be led to a proper
diagnosis by observing that the constitutional symptoms are
much more severe than the amount of external hæmorrhage
would account for. Uterine pain is generally present, of a
tearing and stretching character, sometimes moderate in
amount, more often severe, and occasionally amounting to
intolerable anguish. It is often localised, and, doubtless,
depends on the distension of the uterus by the retained
coagula. If the distension be marked, there may be an
irregularity in the form of the uterus at the site of sangui-
neous effusion ; but this will be difficult to make out, except
in women with thin and unusually lax abdominal parietes.
A rapid increase in the size of the uterus has been described
as a sign by Cazeaux and others. It is not very likely that
this will be appreciable towards the end of utero-gestation,
as a very large amount of effusion would be necessary to
produce it. At an earlier period of pregnancy, at or about
the fifth month, I made it out very distinctly in a case in
my own practice. It obviously must have occurred to an
enormous extent in a case related by Chevalier, in which
post-mortem Cæsarean section was performed under the
impression that the pregnancy had advanced to term, but
only a three months' fœtus was found, imbedded in coagula
which distended the uterus to the size of a nine months'

gestation.[1] Labour pains may be entirely absent. If present, they are generally feeble, irregular, and inefficient.

The only condition, besides ordinary syncope, likely to be confounded with this form of hæmorrhage, is rupture of the uterus, to which the intense pain and profound collapse induce considerable resemblance. The latter rarely occurs until after labour has been some time in progress, and after the escape of the liquor amnii ; whereas hæmorrhage usually occurs either before labour has commenced, or at an early stage. The recession of the presentation, and the escape of the fœtus into the abdominal cavity, in cases of rupture, will further aid in establishing the diagnosis. *Differential diagnosis.*

The prognosis, when blood escapes externally, is, on the whole, not unfavourable. The nature of the case is apparent, and remedial measures are generally adopted sufficiently early to prevent serious mischief. It is different with the concealed form, in which the mortality is very great. Out of Goodell's 106 cases, no less than 54 mothers died. This excessive death-rate is, no doubt, partly due to the fact that extreme prostration often occurs before the existence of hæmorrhage is suspected, and partly to the accident generally happening in women of weakly and diseased constitution. The prognosis to the child is still more grave. Out of 107 children, only 6 were born alive. The almost certain death of the child may be explained by the fact that, when blood collects between the uterus and the placenta, the fœtal portion of the latter is probably lacerated, and the child then also dies from hæmorrhage. *Prognosis.*

In this, as in all other forms of puerperal hæmorrhage, the great hæmostatic is uterine contraction, and that we must try to encourage by all possible means. The first thing to be done, whether the hæmorrhage be apparent or concealed, is to rupture the membranes. If the loss of blood be only slight, this may suffice to control it, and the case may then be left to nature. A firm abdominal binder should, however, be applied to prevent any risk of blood collecting internally, as there is nothing to prevent its filling the uterine cavity after the membranes are ruptured. Contraction may be further advantageously solicited by uterine compression, and by the administration of full doses of ergot. *Treatment.*

[1] *Journ. de Méd. Clin. et Pharmac.* vol. xxi. p. 363.

If hæmorrhage continue, or if we have any reason to suspect concealed hæmorrhage, the sooner the uterus is emptied the better. If the os be sufficiently dilated, the best practice will be to turn without further delay, using the bi-polar method if possible. If the os be not open enough, a Barnes's bag should be introduced, while firm pressure is kept up to prevent uterine accumulation. Should the collapsed condition of the patient be very marked, the mere shock of the operation might turn the scale against her. Under such circumstances it may be better practice to delay further procedure until, by the administration of stimulants, warmth, &c., we have succeeded in producing some amount of reaction, keeping up, in the meanwhile, firm pressure on the uterus. Should the head be low down in the pelvis, it may be easier to complete labour by means of the forceps.

CHAPTER XV.

HÆMORRHAGE AFTER DELIVERY.

HÆMORRHAGE during, or shortly after, the third stage of
labour is one of the most trying and dangerous accidents
connected with parturition. Its sudden and unexpected
occurrence just after the labour appears to be happily ter-
minated, and its alarming effect on the patient, who is often
placed in the utmost danger in a few moments, tax the
presence of mind and the resources of the practitioner to the
utmost, and render it an imperative duty on everyone who
practises midwifery to make himself thoroughly acquainted
with its causes, and preventive and curative treatment.
There is no emergency in obstetrics which leaves less time
for reflection and consultation, and the life of the patient
will often depend on the prompt and immediate action of
the medical attendant.

*Its im-
portance.*

Post-partum hæmorrhage is one of the most frequent
complications of delivery. I do not know of any statistics
which enable us to judge with accuracy of its frequency, but
I believe it to be an unquestionable fact that, especially in
the upper ranks of society, it is very common indeed. This
is probably due to the effects of civilization, and to the mode
of life of patients of that class, whose whole surroundings
tend to produce a lax habit of body which favours uterine
inertia, the principal cause of post-partum hæmorrhage. In
the report of the Registrar-General for the five years, from
1872 to 1876, 3,524 deaths are attributed to flooding. The
majority of these must have been caused by post-partum
hæmorrhage, although some may have been from other
forms.

*Frequency
of post-
partum
hæmor-
rhage.*

Fortunately, it is, to a great extent, a preventable accident.
I believe this fact cannot be too strongly impressed on the
practitioner. If the third stage of labour be properly con-

*Generally
a prevent
able acci-
dent.*

ducted, if every case be treated, as every case ought to be, as if hæmorrhage were impending, it would be much more infrequent than it is. It is a curious fact that post-partum hæmorrhage is much more common in the practice of some medical men than in that of others ; the reason being that those who meet with it often are careless in their manage-ment of their patients immediately after the birth of the child. That is just the time when the assistance of a pro-perly qualified practitioner is of value, much more so than before the second stage of labour is concluded : hence when I hear that a medical man is constantly meeting with severe post-partum hæmorrhage, I hold myself justified, *ipso facto*, in inferring that he does not know, or does not practise, the proper mode of managing the third stage of labour.

Causes. Nature's method of control-ling hæmor-rhage after de-livery.

The placenta, as we have seen, is separated by the last pains, and the blood, which in greater or less quantity accom-panies the fœtus, probably comes from the utero-placental vessels which are then lacerated. Almost immediately after-wards the uterus contracts firmly, and, in a typical labour, assumes the hard cricket-ball form which is so comforting to the accoucheur to feel (see Plate V.). The result is the compression of all the vascular trunks which ramify in its walls, both arteries and veins, and thus the flow of blood through them is prevented. By referring to what has been said as to the anatomy of the muscular fibres of the gravid uterus, especially at the placental site (vol. i. p. 44), it will be seen how admirably they are adapted for this purpose. The arrangement of the vessels themselves favours the hæmostatic action of uterine contraction. The large venous sinuses are placed in layers one above the other, in the thickness of the uterine walls, and they anastomose freely. When the super-imposed layers communicate with those immediately below them, the junction is by a falciform or semilunar opening in the floor of the vessel nearest the external surface of the uterus. Within the margins of this aperture there are muscular fibres, the contraction of which probably tends to prevent retrogression of blood from one layer of vessels into the other. The venous sinuses themselves are of a flattened form, and they are intimately attached to the muscular tissues. It is obvious, then, that these anatomical arrange-ments are eminently adapted to facilitate the closure of the

vessels. They are, however, large, and are destitute of valves ; and, if contraction be absent, or if it be partial and irregular, it is equally easy to understand why blood should pour forth in the appalling amount which is sometimes observed.

If uterine action be firm, regular, and continuous, the vessels must be sealed up, and hæmorrhage effectually prevented. This fact has been doubted by many authorities. Gooch was the first to describe what he called 'a peculiar form of hæmorrhage' accompanying a contracted womb. Similar observations have been made by other writers, such as Velpeau, Rigby, and Gendrin. Simpson says, on this point, that strong uterine contractions 'are not probably so essential a part in the mechanism of the prevention of hæmorrhage from the open orifices of the uterine veins as we might à priori suppose.'[1] With regard to Gooch's cases, it has been pointed out that his own description proves that, however firmly the uterus may have contracted immediately after the expulsion of the child, it must have subsequently relaxed, for he passed his hand into it to remove retained clots, a manœuvre which he could not have practised had tonic contraction been present. In some of these cases the hæmorrhage has been found to come from a laceration of the cervix. Of course, blood may readily escape from mechanical injury of this kind, although the uterus itself be in a satisfactory state of contraction, and the possibility of this occurrence should always be borne in mind. Instances of the successful treatment of this variety of post-partum hæmorrhage by sutures applied to the lacerated cervix have been related by Pallen and others.

Although, then, we may admit that post-partum hæmorrhage is incompatible with persistent contraction of the uterus, it by no means follows that the converse is true. On the contrary, it is not uncommon to meet with cases in which the uterus is large, and apparently quite flaccid, and in which there is no loss of blood. Alternate relaxation and contraction of the uterus after delivery are also of constant occurrence, and yet hæmorrhage, during the relaxation, does not take place. The explanation no doubt is that, immediately after the birth of the child, there was sufficient contraction to prevent hæmorrhage, and that, during its continuance,

Import-ance of tonic uterine contrac-tion.

[1] *Selected Obst. Works,* p. 234.

coagula formed in the mouths of the uterine sinuses, by which they were sufficiently occluded to prevent any loss when subsequent relaxation occurred.

In all probability both uterine contraction and thrombosis are in operation in ordinary cases; and we shall presently see that all the means employed in the treatment of post-partum hæmorrhage act by producing one or other of them.

Secondary causes of hæmorrhage.

Uterine inertia after labour, then, may be regarded as the one great primary cause of post-partum hæmorrhage; but there are various secondary causes which tend to produce it, one of the most frequent of which is exhaustion following a protracted labour. The uterus gets worn out by its efforts, and when the fœtus is expelled, it remains in a relaxed state, and hæmorrhage results. Over-distension of the uterus acts in the same way. Hence hæmorrhage is very frequently met with when there has been an excessive amount of liquor amnii, or in multiple pregnancies. One of the worst cases I ever met with was after the birth of triplets, the uterus having been of an enormous size. Rapid emptying of the uterus, during which there has not been sufficient time for complete separation of the placenta, often tends to the same result. This is the reason why hæmorrhage so frequently follows forceps delivery, especially if the operation have been unduly hurried; and it is one of the chief dangers in what are termed 'precipitate labours.' The general condition of the patient may also strongly predispose to it. Thus it is more often met with in women who have borne families, especially if they be weakly in constitution, comparatively seldom in primiparæ; and for the same reason that after-pains are most common in the former, namely, that the uterus, weakened by frequent child-bearing, contracts in-efficiently. The experience of practitioners in the tropics shows that European women, debilitated by the relaxing effects of warm climates, are peculiarly prone to it, and it forms one of the chief dangers of childbirth amongst the English ladies in India.

Irregular uterine contraction.

Another important cause of post-partum hæmorrhage is partial and irregular contraction of the uterus. Part of the muscular tissue is firmly contracted, while another part is relaxed, and the latter very often the placental site. This has been especially dwelt on by Simpson. He says: 'The

morbid condition which is most frequently and earliest seen
in connection with post-partum hæmorrhage, is a state of
irregularity and want of equability in the contractile action
of different parts of the uterus—and, it may be in different
planes of the muscular fibres—as marked by one or more
points in the organ feeling hard and contracted, at the same
time that other portions of the parietes are soft and relaxed.'

One peculiar variety, which has been much dwelt on by
writers, and is a prominent bugbear to obstetricians, is the
so-called '*hour-glass contraction.*' This in reality seems to Hour-
depend on spasmodic contraction of the internal os uteri, by glass con-
means of which the placenta becomes encysted in the upper traction.

Fig. 143.
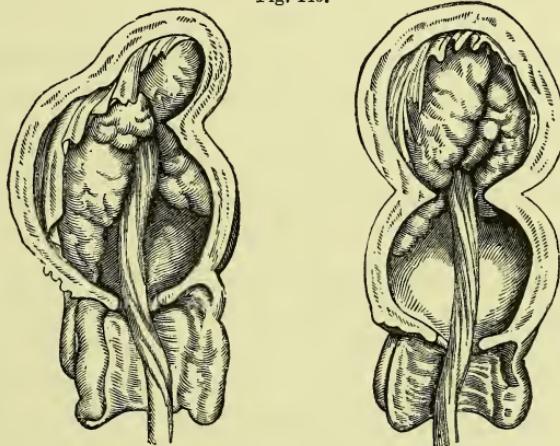
IRREGULAR CONTRACTION OF THE UTERUS, WITH ENCYSTMENT OF THE PLACENTA.

portion of the uterus, which is relaxed.   On introducing the
hand, it first passes through the lax cervical canal, until it
comes to the closed internal os, with the umbilical cord pass-
ing through it, which has generally been supposed to be a
circular contraction of a portion of the body of the uterus.

Encystment of the placenta, however, although more
rarely, unquestionably takes place in a portion only of the
body of the uterus (fig. 143).   Then apparently the placental
site remains more or less paralysed, with the placenta still
attached, while the remainder of the body of the uterus con-
tracts firmly, and thus encystment is produced.

These irregular contractions of the uterus are by no means Causes of
so common as our older authors supposed.   When they do irregular
occur I believe them almost invariably to depend on defective tions.

management of the third stage of labour. 'The most fre-
quent cause,' says Rigby,[1] ' is from over-anxiety to remove
the placenta ; the cord is frequently pulled at, and at length
the os uteri is excited to contract.' While this is being done,
no attempts are probably being made to excite the fundus
to proper action, and, therefore, the hour-glass contraction
is established. Duncan says of this condition : ' Hour-glass
contraction cannot exist unless the parts above the contrac-
tion are in a state of inertia; were the higher parts of the
uterus even in moderate action, the hour-glass contraction
would soon be overcome.'[2] If placental expression were
always employed, if it were the rule to effect the expulsion
of the placenta by a *vis à tergo*, instead of extracting by a
vis à fronte, I feel confident that these irregular and spas-
modic contractions—of the influence of which in producing
hæmorrhage there can be no question—would rarely, if ever,
be met with. It is to be observed that, even in these cases,
it is not because the uterus is in a state of partial contrac-
tion, but because it is in a state of partial relaxation, that
hæmorrhage ensues.

Placental adhesions.   Adhesions of the placenta to the uterine parietes may
cause hæmorrhage, especially if they be partial, and the
remainder of the placenta be detached. The frequency of
these has been over-estimated. Many cases believed to be
examples of adherent placentæ are, in reality, only cases of
placentæ retained from uterine inertia. The experience of
all who see much midwifery will probably corroborate the
observation of Braun, that, ' abnormal adhesion and hour-
glass contraction are more frequently encountered in the
experience of the young practitioner, and they diminish in
frequency in direct ratio to increasing years.'[3] The cause of
adhesion is often obscure, but it most probably results from a
morbid state of the decidua, which is produced by antecedent
disease of the uterine mucous membrane ; then the adhesion
is apt to recur in subsequent pregnancies. The decidua is
altered and thickened, and patches of calcareous and fibrous
degeneration may be often found on the attached surface of
the placenta. Most frequently the placenta is only partially
adherent ; patches of it remain firmly attached to the uterus,

[1] Rigby's *Midwifery*, p. 225.   [2] *Researches in Obstetrics*, p. 389.
[3] Braun's *Lectures*, 1869.

while the rest is separated: hence the uterine walls remain relaxed, and hæmorrhage frequently follows. The diagnosis and management of these very troublesome cases will be found described under the head of treatment (p. 118).

Finally, I think it must be admitted that there are some women who really merit the appellation of 'Flooders,' which has been applied to them, and who, do what we may, have the most extraordinary tendency to hæmorrhage after delivery. I do not think that these cases, however, are by any means so common as some have supposed. I have attended several patients who have nearly lost their lives from post-partum hæmorrhage in former labours, some who have suffered from it in every preceding confinement, and I have only met with two cases in which the assiduous use of preventive treatment failed to avert it. In these (one of which I have elsewhere published in detail [1]), in spite of all my efforts, I could not succeed in keeping up uterine contraction, and the patients would certainly have lost their lives were it not for the means which modern improvements have fortunately placed at our disposal for producing thrombosis in the mouths of the bleeding vessels. The nature of these rare cases requires further investigation; possibly they may, to some extent, be the subjects of the so-called hæmorrhagic diathesis.

Constitutional predisposition to flooding.

The loss of blood may commence immediately after the birth of the child, before the expulsion of the placenta, or not until some time afterwards, when the contracted uterus has again relaxed. It may commence gradually or suddenly; in the latter case, it may begin with a gush, and in the worst form the bedclothes, the bed, and even the floor, are deluged with the blood which, it is no exaggeration to say, is pouring from the patient. If now the hand be placed on the abdomen, we shall miss the hard round ball of the contracted uterus, which will be found soft and flabby, or we may even be unable to make out its contour at all. If the hæmorrhage be slight, or if we succeed in controlling it at once, no serious consequences follow; but if it be excessive, or if we fail to check it, the gravest results ensue.

Signs and symptoms.

There are few sights more appalling to witness than one of the worst cases of post-partum hæmorrhage. The pulse

Exhaustion in extreme cases.

[1] *Obst. Journ.* vol. i.

becomes rapidly affected, and may be reduced to a mere thread, or it may become entirely imperceptible. Syncope often comes on—not in itself always an unfavourable occurrence, as it tends to promote thrombosis in the venous sinuses. Or, short of actual syncope, there may be a feeling of intense debility and faintness. Extreme restlessness soon supervenes, the patient throws herself about the bed, tossing her arms wildly above her head; respiration becomes gasping and sighing, the 'besoin de respirer' is acutely felt, and the patient cries out for more air ; the skin becomes deadly cold, and covered with profuse perspiration ; if the hæmorrhage continue unchecked, we next may have complete loss of vision, jactitation, convulsions, and death.

Formidable as such symptoms are, it is satisfactory to know that recovery often takes place, even when the powers of life seem reduced to the lowest ebb. If we can check the hæmorrhage while there is still some power of reaction left, however slight, we may not unreasonably hope for eventual recovery. The constitution, however, may have received a severe shock, and it may be months, or even years, before the patient recovers from the effects of only a few minutes' hæmorrhage. A death-like pallor frequently follows these excessive losses, and the patient often remains blanched and exsanguine for a long time.

Preventive treatment. The preventive treatment of post-partum hæmorrhage should be carefully practised in every case of labour, however normal. If the practitioner make a habit of never removing his hand from the uterus after the birth of the child until the placenta is expelled, and of keeping up continuous uterine contraction for at least half an hour after delivery is completed, not necessarily by friction on the fundus, but by simply grasping the contracted womb with the palm of the hand and preventing its undue relaxation, cases of post-partum flooding will seldom be met with. As a rule we should, I think, not apply the binder until at least that time has elapsed. The binder is an effective means of keeping up, but not of producing, contraction, and it should never be trusted to for the latter purpose. If it be put on too soon, the uterus may relax under it, and become filled with clots without the practitioner knowing anything about it; whereas this cannot possibly take place as long as the uterine globe

is held in the hollow of the hand. I have seen more than one serious case of concealed hæmorrhage result from the too common habit of putting on the binder immediately after the removal of the placenta. I believe also, as I have formerly said, that it is thoroughly good practice to administer a full dose of the liquid extract of ergot in all cases after the placenta has been expelled, to insure persistent contraction, and to lessen the chance of blood-clots being retained in utero.

These are the precautions which should be used in all cases alike; but when we have reason to fear the occurrence of hæmorrhage, from the history of previous labours or other cause, special care should be taken. The ergot should be given, and preferably in the form of the subcutaneous injection of ergotine, before the birth of the child, when the presentation is so far advanced that we estimate that labour will be concluded in from ten to twenty minutes, as we can hardly expect the drug to produce any effect in less time. Particular attention, moreover, should then be paid to the state of the uterus. Every means should be taken to insure regular and strong contraction, and it is advisable to rupture the membranes early, as soon as the os is dilated or dilatable, to insure stronger uterine action. If any tendency to relaxation occur after delivery, a piece of ice should be passed into the vagina, or into the uterus. Should coagula collect in the uterus, they may be readily expelled by firm pressure on the fundus, and the finger should be passed occasionally up to the cervix, and any which are felt there should be gently picked away.

We should be specially on our guard in all cases in which the pulse does not fall after delivery. If it beat at 100 or more some ten minutes or a quarter of an hour after the birth of the child, hæmorrhage not unfrequently follows; and, hence, it is a good practical rule, which may save much trouble, that a patient should never be left unless the pulse has fallen to its natural standard.

As there are only two means which nature adopts in the prevention of post-partum hæmorrhage, so the remedial measures also may be divided into two classes :—1. Those which act by the production of uterine contraction. 2. Those which act by producing thrombosis in the vessels. Of these

Curative treatment.

the first are the most commonly used ; and it is only in the
worst cases, in which they have been assiduously tried and
have failed, that we resort to those coming under the second
heading.

Uterine pressure. The patient should be placed on her back, in which
position we can more readily command the uterus, as well as
attend to her general state. If the uterus be found relaxed
and full of clots, by firmly grasping it in the hand contraction
may be evoked, its contents expelled, and further hæmor-
rhage at once arrested. Should this fortunately be the
case, we must keep up contraction by gently kneading the
uterus, until we are satisfied that undue relaxation will not
recur.

The powerful influence of friction in promoting contraction
cannot be doubted, and nothing will replace it ; no doubt it
is fatiguing, but as long as it is effectual it must be kept up.
No roughness should be used, as we might produce sub-
sequent injury, but it is quite possible to use considerable
pressure without any violence.

Another method of applying uterine pressure has been
strongly advocated by Dr. Hamilton, of Falkirk, and it may
be serviceable where there is a constant draining from the
uterus, and a capacious pelvis. It consists in passing the
fingers of the right hand high up into the posterior cul-de-sac
of the vagina, so as to reach the posterior surface of the
uterus, while counter-pressure is exercised by the left hand
through the abdomen. The anterior and posterior walls of
the uterus are thus closely pressed together.

During the time that pressure is being applied, attention
can be paid to general treatment; and in giving his directions
to the bystanders the practitioner should be calm and col-
Adminis- lected, avoiding all hurry and excitement. A full dose of
tration of ergot should be administered, and if one have already been
ergot. given, it should be repeated. We cannot, however, look
upon ergot as anything but a useful accessory, and it is one
which requires considerable time to operate. The hypoder-
mic use of ergotine offers the double advantage, in severe
cases, of acting with greater power, and much more rapidly,
than the usual method of administration. It should, there-
fore, always be used in preference. An aqueous solution of
ergotinine, $\frac{1}{200}$th of a grain in 10 minims, has been highly

recommended by Chahbazain, of Paris, as acting more ener-
getically, and, it has seemed to me,[1] have had a good effect.

The sudden flow will probably have produced exhaustion
and a tendency to syncope, and the administration of stimu-
lants will be necessary. The amount must be regulated by
the state of the pulse, and the degree of exhaustion. There
is no more absurd mistake, however, than implicitly relying
on the brandy bottle to check post-partum hæmorrhage. In
the worst cases absorption is in abeyance, and brandy may
be poured down in abundance, the practitioner believing that
he is rousing his patient, while he is, in fact, only filling the
stomach with a quantity of fluid which is eventually thrown
up unaltered. I have more than once seen symptoms, pro-
duced by the over-free use of brandy in slight floodings,
which were certainly not those of hæmorrhage. I remember
on one occasion being summoned by a practitioner, with a
view to transfusion, to a patient who was said to be insen-
sible and collapsed from hæmorrhage. I found her, indeed,
unconscious ; but with a flushed face, a bounding pulse, a
firmly contracted uterus, and deep stertorous breathing. On
inquiry I ascertained that she had taken an enormous
quantity of brandy, which had brought on the coma of
profound intoxication, while the hæmorrhage had obviously
never been excessive.

Stimu-lants.

The hypodermic injection of sulphuric ether is a remedy
of great value as a powerful stimulant in cases in which
exhaustion is very great. It has the advantage of acting
rapidly, and of being capable of administration when the
patient is unable to swallow. A fluid-drachm may be injected
into the nates, or thigh, and the injection may be repeated as
the state of the patient may require.

Hypo-dermic injection of ether.

The window should be thrown widely open, to allow a
current of fresh cold air to circulate freely through the room.
The pillows should be removed, the head kept low, and the
patient should be assiduously fanned.

Fresh air, &c.

If bleeding continue, or if it commence before the
placenta is expelled, the hand should be carefully and gently
passed into the uterus, and its cavity cleared of its contents.
The mere presence of the hand within the uterus is a power-
ful inciter of uterine action. When the placenta is retained

Emptying of uterus.

[1] *Obst. Trans.* 1882.

it is the more essential, as the hæmorrhage cannot possibly be checked as long as the uterus is distended by it. During the operation the uterus should be supported by the left hand externally, and, by using the two hands in concert, the chances of injuring the textures are greatly lessened.

Treatment of hour-glass contraction. If the so-called 'hour-glass contraction' be present, or if the placenta be morbidly adherent, the operation will be more difficult, and will require much judgment and care. The spasmodic contraction of the inner os in the former case may generally be overcome by gentle and continuous pressure of the fingers passed within the contraction, while the uterus is supported from without. By this means, too, further hæmorrhage can in most cases be controlled, until the spasm is sufficiently relaxed to admit of the passage of the hand.

Signs of adherent placenta. There are no very reliable signs to indicate morbid adhesion of the placenta, previous to the introduction of the hand. The following are the symptoms as laid down by Barnes, any of which might, however, accompany non-detachment of the placenta, unaccompanied by adhesion : 'You may suspect morbid adhesion, if there have been unusual difficulty in removing the placenta in previous labours ; if during the third stage the uterus contracts at intervals firmly, each contraction being accompanied by blood, and yet on following up the cord, you feel the placenta *in utero* ; if, on pulling on the cord, two fingers being pressed into the placenta at the root, you feel the placenta and uterus descend in one mass, a sense of dragging pain being elicited ; if, during a pain the uterine tumour does not present a globular form, but be more prominent than usual at the place of placental attachment.'[1]

Treatment of adherent placenta. The artificial removal of an adherent placenta is always a delicate and anxious operation, which, however carefully performed, must of necessity expose the patient to the risk of injury to the uterine structures, and of leaving behind portions of placental tissue, which may give rise to secondary hæmorrhage, or septicæmia. The cord will guide the hand to the site of attachment, and the fingers must be very gently insinuated between the lower edge of the placenta and the uterine wall ; or if a portion be already detached, we may commence to peel off the remainder at that spot.

[1] *Obstetric Operations*, p. 440.

Supporting the uterus externally, we carefully pick off as much as possible, proceeding with the greatest caution, as it is by no means easy to distinguish between the placenta and the uterus. At the best it is far from easy to remove all, and it is wiser to separate only what we readily can, than to make too protracted efforts at complete detachment. When it is found to be impossible to detach and remove the whole, or a great part of the placenta, we cannot but look upon the further progress of the case with considerable anxiety. The retained portions may be, ere long, spontaneously detached and expelled, or they may decompose and give rise to fœtid discharge and septic infection. Such cases must be treated by antiseptic intra-uterine injections, so as to lessen the risk of absorption as much as possible ; but until the retained masses have been expelled, and the discharge has ceased, the patient must be considered to be in considerable danger. In a few rare cases, there is reason to believe that considerable masses of retained placental tissue have been entirely absorbed. It is difficult to understand so strange a phenomenon, but several well-authenticated cases are recorded in which there seems no reason to doubt that the retained placenta was removed in this way.[1]

Various means are used for exciting uterine contraction by reflex stimulation. Amongst the most important of these is cold. In patients who are not too exhausted to respond to the stimulus applied, it is of extreme value. But, to be of use, it should be used intermittently, and not continuously. Pouring a stream of cold water from a height on the abdomen is a not uncommon, but bad, practice, as it deluges the patient and the bedding in water, which may afterwards act injuriously. Flapping the lower part of the abdomen with a wet towel is less objectionable. Ice can generally be obtained, and a piece should be introduced into the uterus. This is a very powerful hæmostatic, and often excites strong action when other means fail. I constantly employ it, and have never seen any bad results follow. A large piece of ice may also be held over the fundus, and removed, and reapplied from time to time. Iced water may be injected into the rectum. A very powerful remedy is washing out

Excitement of reflex action by cold, &c.

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[1] See an interesting paper by Dr. Thrush on ' Retention of the Placenta in Labour at Term.' *Amer. Journ. of Obstet.* July 1877.

the uterine cavity with a stream of cold water, by means of the vaginal pipe of a Higginson's syringe carried up to the fundus. Another means of applying cold, said to be very effectual, is the application of the ether spray, such as is used for producing local anæsthesia, over the lower part of the abdomen.[1] All these remedies, however, depend for their good results on the fact of the patient being in a condition to respond to stimulus ; and their prolonged use, if they fail to excite contraction rapidly, will certainly prove injurious. Rigby used to look upon the application of the child to the breast as one of the most certain inciters of uterine action. It may be of service after the hæmorrhage has been checked, in keeping up tonic contraction, and should therefore not be omitted; but we certainly cannot waste time in inducing the child to suck in the face of the actual emergency.

Intra-uterine injections of warm water. Of late, intra-uterine injections of warm water, at a temperature of from 100° to 120°, have been highly recommended as a powerful means of arresting post-partum hæmorrhage, often proving effectual when all other treatment has failed. The number of published cases in which it has proved of great value is now considerable. The present Master of the Rotunda, Dr. Lombe Atthill, has recorded 16 cases [2] in which it checked hæmorrhage at once, in many of which ergot, ice, and other means had failed. He speaks of it as especially useful in those troublesome cases in which the uterus alternately relaxes and hardens, and resists all our efforts to produce permanent contraction. My own experience of this treatment is very favourable. I have now used it in several cases, in some of which the tendency to hæmorrhage was very great, and in every instance it has at once produced strong uterine action and instantly checked the flow. It is, moreover, much more agreeable to the patient than cold applications. I think it cannot be doubted that we have in these warm irrigations a valuable addition to our methods of treating uterine hæmorrhage.

State of the bladder. The late Dr. Earle pointed out [3] that a distended bladder often prevents contraction, and to avoid the possibility of this the catheter should be passed.

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[1] Griffiths, *Practitioner*, March 1877.   [2] *Lancet*, February 9, 1878.
[3] Earle's *Flooding after Delivery*, p. 163.

Plugging of the vagina has often been used. It is only necessary to mention it for the purpose of insisting on its absolute inapplicability in all cases of post-partum hæmorrhage ; the only effect it could have would be to prevent the escape of blood externally, which might then collect to any extent in the cavity of the uterus.

Compression of the abdominal aorta is highly thought of by many Continental authorities, but it is little known or practised in this country. It has been objected to by some on the theoretical ground that the hæmorrhage is chiefly venous, and not arterial, and that it would only favour the reflux of venous blood into the vena cava. Cazeaux points out that, on account of the close anatomical relations between the aorta and the vena cava, it is hardly possible to compress one vessel without the other. The backward flow of blood, therefore, through the vena cava may also be thus arrested. There is strong evidence in favour of the occasional utility of compression. Its chief recommendation is, that it can be practised immediately, and by an assistant, who can be shown how to apply the pressure. It is most likely to prove useful in sudden and severe hæmorrhage, and, if it only control the loss for a few moments, it gives us time to apply other methods of treatment. As a temporary expedient, therefore, it should be borne in mind, and adopted when necessary. It has the great advantage of supplementing, without superseding, other and more radical plans of treatment. The pressure is very easily applied, on account of the lax state of the abdominal walls. The artery can readily be felt pulsating above the fundus uteri, and can be compressed against the vertebræ by three or four fingers applied lengthways. Baudelocque, who was a strong advocate of this procedure, states that he has, on several occasions, controlled an otherwise intractable hæmorrhage in this way, and that he, on one occasion, kept up compression for four consecutive hours. Cazeaux believes that compression of the aorta may have a further advantageous effect in retaining the mass of the blood in the upper part of the body, and thus lessening the tendency to syncope and collapse. If an aortic tourniquet, such as is used for compressing the vessel in cases of aneurism, could be obtained, it might be used with advantage in such cases.

If a battery is at hand, the Faradic current may be used, and is, it is said, a very powerful agent in inducing uterine contraction, one pole being introduced into the uterus, the other applied over it through the abdominal parietes.

Bandag-
ing of the
extremi-
ties.
When the hæmorrhage has been excessive, and there is profound exhaustion, firm bandaging of the extremities, by preference with Esmarch's elastic bandages if they can be obtained, may be advantageously adopted, with the view of retaining the blood as much as possible in the trunk, and thus lessening the tendency to syncope. As a temporary expedient in the worst class of cases it may occasionally prove of service.

Injec-
tion of
styptics.
Supposing these means fail, and the uterus obstinately refuses to contract in spite of all our efforts—and, do what we may, cases of this kind will occur—the only other agent at our command is the application of a powerful styptic to the bleeding surface to produce thrombosis in the vessels. 'The latter,' says Dr. Ferguson,[1] alluding to this means of arresting hæmorrhage, 'appears to be the sole means of safety in those cases of intense flooding in which the uterus flaps about the hand like a wet towel. Incapable of contraction for hours, yet ceasing to ooze out a drop of blood, there is nothing apparently between life and death but a few soft coagula plugging up the sinuses.' These form but a frail barrier indeed, but the experience of all who have used the injection of a solution of perchloride of iron in such cases proves that they are thoroughly effectual, and their introduction into practice is one of the greatest improvements in modern midwifery. Although this method of treating these obstinate cases is not new, since it was practised long ago in Germany, its adoption in this country is unquestionably due to the energetic recommendation of Dr. Barnes. Although the dangers of the practice have been strongly insisted on, and with a degree of acrimony that is to be regretted, I know of only one published case in which its use has been followed by any evil effects. Its extraordinary power, however, of instantly checking the most formidable hæmorrhage has been demonstrated by the unanimous testimony of all who have tried it. As it is not proposed by anyone that this means of treatment should be employed until all ordinary methods

[1] Preface to Gooch On Diseases of Women, p. xlii.

of evoking contraction have failed, and as, in cases of this kind, the lives of the patients are of necessity imperilled, we should be fully justified in adopting it, even if its possibly injurious effects had been much more certainly proved. It is surely at any time justifiable to avoid a great and pressing peril by running a possible chance of a less one. Whenever, therefore, we have tried the plans above indicated in vain, no time should be lost in resorting to this expedient. No practitioner should attend a case of midwifery without having the necessary styptic with him. The best and most easily obtainable form of using the remedy is the ' liquor ferri per-chloridi fortior' of the London Pharmacopœia, which should be diluted for use with six times its bulk of water. This is certainly better than a weaker solution. The vaginal pipe of a Higginson's syringe, through which the solution has once or twice been pumped to exclude the air, is guided by the hand to the fundus uteri, and the fluid injected gently over the uterine surface. The loose and flabby mucous membrane is instantaneously felt to pucker up, all the blood with which the fluid comes in contact is coagulated, and the hæmorrhage is immediately arrested. I think it is of importance to make sure that the uterus and vagina are emptied of clots before injection. In the only cases in which I have seen any bad symptoms follow this precaution had been neglected. The iron hardened all the coagula, which remained in utero, and septicæmia supervened; which, however, disappeared after the clots had been broken up and washed away by intra-uterine antiseptic injections. After we have resorted to this treatment, all further pressure on the uterus should be stopped. We must remember that we have now abandoned contraction as an hæmostatic, and are trusting to thrombosis, and that pressure might detach and lessen the coagula which are preventing the escape of blood.

Other local astringents may be eventually found to be of use. Tincture of matico possibly might be serviceable, although I am not aware that it has been tried. Dupierris has advocated tincture of iodine, and has recorded 24 cases in which he employed it, in all without accident and with a successful issue. Penrose strongly recommends common vinegar, which has the advantage of being always readily

obtainable.   But nothing seems likely to act so immediately or so effectually as the perchloride of iron.

Hæmor-
rhage
from lace-
ration of
maternal
structures.

A word may here be said as to the occasional dependence of hæmorrhage after delivery on laceration of the cervix or other injury to the maternal soft parts.   Duncan has narrated a case in which the bleeding came from a ruptured perinæum. If hæmorrhage continue after the uterus is permanently contracted, a careful examination should be made to ascertain if any such injury exist.   Most generally the source of bleeding is the cervix, and the flow can be readily arrested by swabbing the injured textures with a sponge saturated in a solution of the perchloride.

Secondary
treatment.

The secondary treatment of post-partum hæmorrhage is of importance.   When reaction commences a train of distressing symptoms often show themselves, such as intense and throbbing headache, great intolerance of light and sound, and general nervous prostration ; and, when these have passed away, we have to deal with the more chronic effects of profuse loss of blood.   Nothing is so valuable in relieving these symptoms as opium.   It is the best restorative that can be employed, but it must be administered in larger doses than usual.   Thirty to forty drops of Battley's solution should be given by the mouth, or in an enema.   At the same time the patient should be kept perfectly still and quiet, in a darkened room, and the visits of anxious friends strictly forbidden. Strong beef-essence or gravy soup, milk, or eggs beat up with milk, and similar easily absorbed articles of diet should be given frequently, and in small quantities at a time. Stimulants will be required according to the state of the patient, such as warm brandy-and-water, port wine, &c. Rest in bed should be insisted on, and continued much beyond the usual time.   Eventually the remedies which act by promoting the formation of blood, such as the various preparations of iron, will be found useful, and may be required for a length of time.

Trans-
fusion.

Under the head of transfusion, I have separately treated the application of that last resource in those desperate cases in which the loss of blood has been so excessive as to leave no other hope.

Secondary
post-
partum

In the majority of cases, if a few hours have elapsed after delivery without hæmorrhage, we may consider the patient

safe from the accident.   It is by no means very rare, however, hæmor-rhage.
to meet with even profuse losses of blood coming on in the
course of convalescence, at a time varying from a few hours
or days up to several weeks after delivery.   These cases are
described as examples of 'secondary hæmorrhage,' and they
have not received at all an adequate amount of attention
from obstetric writers, inasmuch as they often give rise to
very serious, and even fatal, results, and are always somewhat
obscure in their etiology, and difficult to treat.   We owe
almost all our knowledge of this condition to an excellent
paper by Dr. McClintock, of Dublin, who has collected cha-
racteristic examples from the writings of various authors,
and accurately described the causes which are most apt to
produce it.

We must, in the first place, distinguish between true Profuse lochial discharge.
secondary hæmorrhage and profuse lochial discharge, con-
tinued for a longer time than usual.   The latter is not a very
uncommon occurrence, and is generally met with in cases in
which involution of the uterus has been checked; as by too
early exertion, general debility, and the like.   The amount
of the lochial discharge varies in different women.   In some
patients it habitually continues during the whole puerperal
month, and even longer, but not to an extent which justifies
us in including it under the head of hæmorrhage.   In such
cases prolonged rest, avoidance of the erect posture, occa-
sional small doses of ergot, and, it may be, after the lapse of
some weeks, astringent injections of oak-bark or alum, will
be all that is necessary in the way of treatment.

True secondary hæmorrhage is often sudden in its ap-
pearance and serious in its effects.   McClintock mentions
6 fatal cases, and Mr. Bassett, of Birmingham,[1] has recorded
13 examples which came under his own observation, 2 of
which ended fatally.

The causes may be either constitutional, or some local The causes are either con-stitutional or local.
condition of the uterus itself.

Among the former are such as produce a disturbance of Constitu-tional causes.
the vascular system of the body generally, or of the uterine
vessels in particular.   The state of the uterine sinuses, and
the slight barrier which the thrombi formed in them offer
to the escape of blood, readily explain the fact of any sudden

[1] *Brit. Med. Jour.* 1872.

vascular congestion producing hæmorrhage. Thus mental emotions, the sudden assumption of the erect posture, any undue exertion, the incautious use of stimulants, a loaded condition of the bowels, or sexual intercourse shortly after delivery, may act in this way. McClintock records the case of a lady in whom very profuse hæmorrhage occurred on the twelfth day after labour, when sitting up for the first time. Feeling faint after suckling, the nurse gave her some brandy, whereupon a gush of blood ensued, ' deluging all the bed-clothes and penetrating through the mattress so as to form a pool on the floor.' Here the erect position, the exquisite pain caused by nursing, and the stimulating drink, all con-curred to excite the hæmorrhage. In another instance the flooding was traced to excitement produced by the sudden return of an old lover on the eighth day after labour. Moreau especially dwells on the influence of local congestion produced by a loaded condition of the rectum. Constitutional affections producing general debility, and an impoverished state of the blood, probably also may have the same effect. Blot specially mentions albuminuria as one of these, and Saboia states that in Brazil secondary hæmorrhage is a com-mon symptom of miasmatic poisoning, and can only be cured by change of air and the free use of quinine.[1]

Local causes. Local conditions seem, however, to be the more frequent factors in the production of secondary hæmorrhage. These may be generally classed under the following heads :—

1. Irregular and inefficient contraction of the uterus.
2. Clots in the uterine cavity.
3. Portions of retained placenta or membranes.
4. Retroflexion of the uterus.
5. Laceration or inflammatory state of the cervix.
6. Thrombosis or hæmatocele of the cervix or vulva.
7. Inversion of the uterus.
8. Fibroid tumours or polypus of the uterus.

The first four of these need only now be considered, the others being described elsewhere.

Relaxa-tion of, and clots in, the uterus. Relaxation of the uterus and distension of its cavity by coagula may give rise to hæmorrhage, although not so readily as immediately after delivery, for coagula of considerable size are often retained in utero for many days after labour. The

[1] Saboia, *Traité des Accouchements*, p. 819.

uterus will be found larger than it ought to be, and tender
on pressure. Usually the coagula are expelled with severe
after-pains; but this may not take place, and hæmorrhage
may ensue several days after delivery. Or there may be
only a relaxed state of the uterus without retained coagula.
Bassett relates 4 cases traced to these causes, and several
illustrations will be found in McClintock's paper. Portions
of retained placenta or membranes are more frequent causes. of retained
The retention may be due to carelessness on the part of the placenta
practitioner, especially if he have removed the placenta by or mem-
traction, and failed to satisfy himself of its integrity. It may, branes.
however, often be due to circumstances entirely beyond his
control; such as adherent placenta, which it is impossible
to remove without leaving portions in utero, or more rarely
placenta succenturia. In the latter case there is a small
supplementary portion of placental tissue developed entirely
separate from the general mass, and it may remain in utero
without the practitioner having the least suspicion of its
existence. Portions of the membranes are very apt to be
left in utero. It is to prevent this that they should be
twisted into a rope, and extracted very gently after expression
of the placenta. Hæmorrhage from these causes generally
does not occur until at least a week after delivery, and it may
not do so until a much longer time has elapsed. In 4 cases
recorded by Mr. Bassett, it commenced on the tenth, twelfth,
fourteenth, and thirty-second day. It may come on suddenly
and continue; or it may stop, and recur frequently at short
intervals. In my experience retention of portions of the
placenta is very common after abortion, when adhesions are
more generally met with than at term. In addition to the
hæmorrhage there is often a fœtid discharge, due to decom-
position of the retained portion, and possibly more or less
marked septicæmic symptoms, which may aid in the diagnosis.
The placenta or membranes may simply be lying loose as
foreign bodies in the uterine cavity; or they may be organi-
cally attached to the uterine walls, when their removal will
not be so easily effected.

Barnes has especially pointed out the influence of retro- Retro-
flexion of the uterus in producing secondary hæmorrhage,[1] flexion.

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[1] *Obstetric Operations*, p. 492.

which seems to act by impeding the circulation at the point of flexion, and thus arresting the process of involution.

In every case in which secondary hæmorrhage occurs to any extent, careful investigation into the possible causes of the attack, and an accurate vaginal examination, are imperatively required. If it be due to general and constitutional causes only, we must insist on the most absolute rest on a hard bed in a cool room, and on the absence of all causes of excitement. The liquid extract of ergot will be very generally useful in ʒj. doses repeated every six hours. McClintock strongly recommends the tincture of Indian hemp, which may be advantageously combined with the ergot, in doses of 10 or 15 minims, suspended in mucilage. Astringent vaginal pessaries of matico or perchloride of iron may be used. Special attention should be paid to the state of the bowels, and, if the rectum be loaded, it should be emptied by enemata. In more chronic cases a mixture of ergot, sulphate of iron, and small doses of sulphate of magnesia will prove very serviceable. This is more likely to be effectual when the bleeding is of an atonic and passive character. McClintock speaks strongly in favour of the application of a blister over the sacrum. When the hæmorrhage is excessive, more effectual local treatment will be required. Cazeaux advises plugging of the vagina. Although this cannot be considered so dangerous as immediately after delivery, inasmuch as the uterus is not so likely to dilate above the plug, still it is certainly not entirely without risk of favouring concealed internal hæmorrhage. If it be used at all, a firm abdominal pad should be applied, so as to compress the uterus; and the abdomen should be examined, from time to time, to insure against the possibility of uterine dilatation. With these precautions the plug may prove of real value. In any case of really alarming hæmorrhage I should be disposed rather to trust to the application of styptics to the uterine cavity. The injection of fluid in bulk, as after delivery, could not be safely practised, on account of the closure of the os and the contraction of the uterus. But there can be no objection to swabbing out the uterine cavity with a small piece of sponge attached to a handle, and saturated in a solution of the perchloride of iron. There are few cases which will resist this treatment.

If we have reason to suspect retained placenta or mem-branes, or if the hæmorrhage continue or recur after treat-ment, a careful exploration of the interior of the womb will be essential. On vaginal examination, we may possibly feel a portion of the placenta protruding through the os, which can then be removed without difficulty. If the os be closed, it must be dilated with sponge or laminaria tents, or by a small-sized Barnes's bag, and the uterus can then be thoroughly explored. This ought to be done under chloro-form, as it cannot be effectually accomplished without intro-ducing the whole hand into the vagina, which necessarily causes much pain. If the placenta or membranes be loose in the uterine cavity, they may be removed at once ; or if they be organically attached, they may be carefully picked off. The uterus should at the same time, as long as the os remains patulous, be thoroughly washed out with Condy's fluid and water, to diminish the risk of septicæmia.

Retroflexion can readily be detected by vaginal examina-tion, and the treatment consists in careful reposition with the hand, and the application of a large-sized Hodge's pessary.

CHAPTER XVI.

RUPTURE OF THE UTERUS, ETC.

Its
fatality.

RUPTURE of the uterus is one of the most dangerous accidents of labour, and until of late years it has been considered almost necessarily fatal and beyond the reach of treatment.

Is of infrequent occurrence.

Fortunately it is not of very frequent occurrence, although the published statistics vary so much that it is by no means easy to arrive at any conclusion on this point. The explanation is, no doubt, that many of the tables confound partial and comparatively unimportant lacerations of the cervix and vagina with rupture of the body and fundus. It is only in large lying-in institutions, where the results of cases are accurately recorded, that anything like reliable statistics can be gathered, for in private practice the occurrence of so lamentable an accident is likely to remain unpublished. To show the difference between the figures given by authorities, it may be stated that, while Burns calculates the proportion to be 1 in 940 labours, Ingleby fixes it as 1 in 1,300 or 1,400, Churchill as 1 in 1,331, and Lehmann as 1 in 2,433. Dr. Jolly, of Paris, has published an excellent thesis containing much valuable information.[1] He finds that out of 782,741 labours, 230 ruptures, excluding those of the vagina or cervix, occurred—that is, 1 in 3,403.

Seat of
rupture.

Lacerations may occur in any part of the uterus—the fundus, the body, or the cervix. Those of the cervix are comparatively of small consequence, and occur, to a slight extent, in almost all first labours. Only those which involve the supra-vaginal portion are of really serious import. Ruptures of the upper part of the uterus are much less frequent than of the portion near the cervix; partly, no doubt, because the fundus is beyond the reach of the mechanical causes to

[1] *Rupture utérine pendant le Travail*, Paris, 1873.

which the accident can, not unfrequently, be traced, and partly because the lower third of the organ is apt to be compressed between the presenting part and the bony pelvis. The site of placental insertion is said by Madame La Chapelle to be rarely involved in the rupture, but it does not always escape, as numerous recorded cases prove. The most frequent seat of rupture is near the junction of the body and neck, either anteriorly or posteriorly, opposite the sacrum, or behind the symphysis pubis, but it may occur at the sides of the lower segment of the uterus. In some cases the entire cervix has been torn away, and separated in the form of a ring.

Most frequent near the junction of body and cervix.

The laceration may be partial or complete, the latter being the more common. The muscular tissue alone may be torn, the peritoneal coat remaining intact; or the converse may occur, and then the peritoneum is often fissured in various directions, the muscular coat being unimplicated. The extent of the injury is very variable; in some cases being only a slight tear, in others forming a large aperture, sufficiently extensive to allow the fœtus to pass into the abdominal cavity. The direction of the laceration is as variable as the size, but it is more frequently vertical than transverse or oblique. The edges of the tear are irregular and jagged; probably on account of the contraction of the muscular fibres which are frequently softened, infiltrated with blood, and even gangrenous. Large quantities of extravasated blood will be found in the peritoneal cavity; such hæmorrhage, indeed, being one of the most important sources of danger.

Rupture may be partial or complete.

The causes are divided into *predisposing* and *exciting*; and the progress of modern research tends more and more to the conclusion that the cause which leads to the laceration could only have operated because the tissue of the uterus was in a state predisposed to rupture, and that it would have had no such effect on a perfectly healthy organ. What these predisposing changes are, and how they operate, is yet far from being known, and the subject offers a fruitful field for pathological investigation.

Causes are either predisposing or exciting.

It is generally believed that lacerations are more common in multiparæ than in primiparæ. Tyler Smith contended that ruptures are relatively as common in first as in subsequent labours, while Bandl[1] found that only 64 cases out

Said to be more common in multiparæ.

[1] *Über Ruptur der Gebärmutter.* Wein, 1815.

of 546 ruptures were in primiparæ. Statistics are not suf-
ficiently accurate or extensive to justify a positive conclusion,
but it is reasonable to suppose that the pathological changes
presently to be mentioned as predisposing to laceration are
more likely to be met with in women whose uteri have fre-
quently undergone the alteration attendant on repeated
pregnancies. Age seems to have considerable influence, as
a large proportion of cases have occurred in women between
thirty and forty years of age.

Altera-
tions in
the tissues
of the
uterus.

Alterations in the tissues of the uterus are probably
of very great importance in predisposing to the accident,
although our information on this point is far from accurate.
Among these are morbid states of the muscular fibres, the
result of blows and contusions during pregnancy; premature
fatty degeneration of the muscular tissues, an anticipation,
as it were, of the normal involution after delivery; fibroid
tumours or malignant infiltration of the uterine walls, which
either produce a morbid state of the tissues, or act as an im-
pediment to the expulsion of the fœtus. The importance of
such changes has been specially dwelt on by Murphy in this
country, and by Lehmann in Germany, and it is impossible
not to concede their probable influence in favouring lacera-
tion. However, as yet these views are founded more on
reasonable hypothesis than on accurately observed patho-
logical facts.

Want of
proper
proportion
between
the pelvis
and child.

Deformity
in pelvis is
a frequent
cause.

Another and very important class of predisposing causes
are those which lead to a want of proper proportion between
the pelvis and the fœtus.

Deformity of the pelvis has been very frequently met
with in cases in which the uterus has ruptured. Thus out
of 19 cases, carefully recorded by Radford,[1] the pelvis was
contracted in 11, or more than one-half. Radford makes
the curious observation that ruptures seem more likely to
occur when the deformity is only slight: and he explains
this by supposing that in slight deformities the lower seg-
ment of the uterus engages in the brim, and is, therefore,
much subjected to compression; while in extreme deformity
the os and cervix uteri remain above the brim, the body and
fundus of the uterus hanging down between the thighs of the
mother. This explanation is reasonable; but the rarity with

[1] *Obst. Trans.* vol. viii.

which ruptured uterus is associated with extreme pelvic deformity may rather depend on the infrequency of advanced degrees of contraction.

Bandl, who has made the most important of modern con- Views of tributions to our knowledge of the subject, points out that Bandl. rupture nearly always begins in the lower segment of the uterus, which becomes abnormally stretched and distended, when from any cause the expulsion of the fœtus is delayed.

Fig. 144.
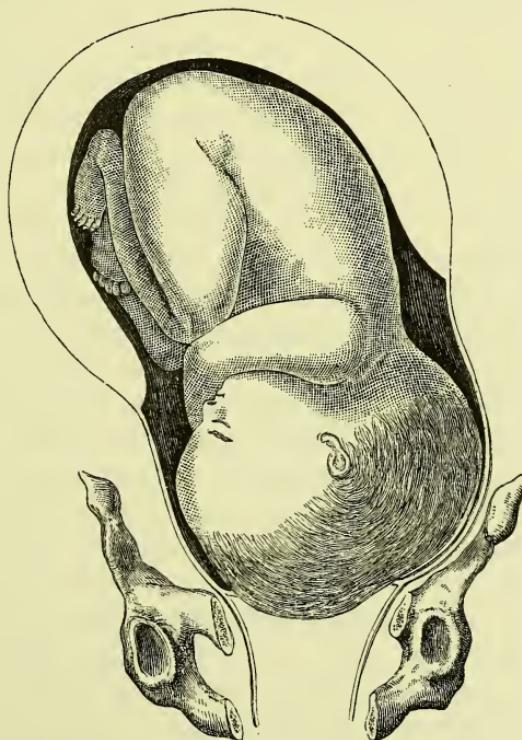
ILLUSTRATING THE DANGEROUS THINNING OF THE LOWER SEGMENT OF UTERUS OWING TO NON-DESCENT OF HEAD IN A CASE OF INTRA-UTERINE HYDROCEPHALUS. (After Bandl.)

The upper portion of the uterus becomes, at the same time, retracted and much thickened (see fig. 144). As the pains continue the stretching of the lower segment, called by Spiegelberg the 'obstetrical cervix,' becomes more and more marked until at last its fibres separate, and a laceration is established. The line of demarcation between the thickened body and the distended lower segment, known as the ring of Bandl, can, in such cases, be occasionally made out by palpation above the pubes.

Amongst causes of disproportion depending on the fœtus are either malpresentation, in which the pains cannot effect expulsion, or undue size of the presenting part. In the latter way may be explained the observation that rupture is more frequently met with in the delivery of male than of female children, on account, no doubt, of the larger size of the head in the former. The influence of intra-uterine hydrocephalus was first prominently pointed out by Sir James Simpson,[1] who states that out of 74 cases of intra-uterine hydrocephalus the uterus ruptured in 16. In all such cases of disproportion, whether referable to the pelvis or fœtus, rupture is produced in a twofold manner, either by the excessive and fruitless uterine contractions, which are induced by the efforts of the organ to overcome the obstacle ; or by the compression of the uterine tissue between the presenting part and the bony pelvis, leading to inflammation, softening, and even gangrene.

The proximate cause of rupture may be classed under two heads—mechanical injury and excessive uterine contraction. Under the former are placed those uncommon cases in which the uterus lacerates as the result of some injury in the latter months of pregnancy, such as blows, falls, and the like. Not so rare, unfortunately, are lacerations produced by unskilled attempts at delivery on the part of the medical attendant, such as by the hand during turning, or by the blades of the forceps. Many such cases are on record, in which the accoucheur has used force and violence, rather than skill, in his attempts to overcome an obstacle. That such unhappy results of ignorance are not so uncommon as they ought to be is proved by the figures of Jolly, who has collected 71 cases of rupture during podalic version, 37 caused by the forceps, 10 by the cephalotribe, and 30 during other operations, the precise nature of which is not stated.[2] The *modus*

operandi of protracted and ineffectual uterine contractions, as a proximate cause of rupture, is sufficiently evident, and need not be dwelt on. It is necessary to allude, however, to the effect of ergot, incautiously administered, as a producing

cause. There is abundant evidence that the injudicious exhibition of this drug has often been followed by laceration of the unduly stimulated uterine fibres. Thus, Trask, talking of the subject, says that Meigs had seen three cases, and

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[1] *Selected Obst. Works*, p. 385. [2] *Op. cit.* p. 38.

Bedford four, distinctly traceable to this cause.   Jolly found that ergot had been administered largely in 33 cases in which rupture occurred.

Some have believed that the impending occurrence of rupture could frequently be ascertained by peculiar premonitory symptoms, such as excessive and acute crampy pains about the lower part of the abdomen, due to the compression of part of the uterine walls.   These are far too indefinite to be relied on, and it is certain that the rupture generally takes place without any symptoms that would have afforded reasonable grounds for suspicion.

Premonitory symptoms.

The symptoms are often so distinct and alarming as to leave no doubt as to the nature of the case.   Not infrequently, however, especially if the laceration be partial, they are by no means so well marked, and the practitioner may be uncertain as to what has taken place.   In the former class of cases a sudden excruciating pain is experienced in the abdomen, generally during the uterine contractions, accompanied by a feeling, on the part of the patient, of something having given way.   In some cases this has been accompanied by an audible sound, which has been noticed by the bystanders.   At the same time there is generally a considerable escape of blood from the vagina, and a prominent symptom is the sudden cessation of the previously strong pains. Alarming general symptoms soon develop, partly due to shock, partly to loss of blood, both external and internal. The face exhibits the greatest suffering, the skin becomes deadly cold and covered with a clammy sweat, and fainting, collapse, rapid feeble pulse, hurried breathing, vomiting, and all the usual signs of extreme exhaustion quickly follow.

General symptoms.

Abdominal palpation and vaginal examination both afford characteristic indications in well-marked cases.   If the child, as often happens, has escaped entirely, or in great part into the abdominal cavity, it may be readily felt through the abdominal walls; while in the former case, the partially contracted uterus may be found separate from it in the form of a globular tumour, resembling the uterus after delivery. Per vaginam it may generally be ascertained that the presenting part has suddenly receded, and can no longer be made out, or some other part of the fœtus may be found in its place.   If the rupture be extensive, it may be appreciable

Results of abdominal and vaginal examinations.

on vaginal examination, and, sometimes, a loop of intestine may be found protruding through the tear. Other occasional signs have been recorded, such as an emphysematous state of the lower part of the abdomen, resulting from the entrance of air into the cellular tissue; or the formation of a sanguineous tumour in the hypogastrium, or vagina. These are too uncommon, and too vague, to be of much diagnostic value.

Symptoms are sometimes obscure. Unfortunately the symptoms are by no means always so distinct, and cases occur in which most of the reliable indications, such as the sudden cessation of the pains, the external hæmorrhage, and the retrocession of the presenting part may be absent. In some cases, indeed, the symptoms have been so obscure that the real nature of the case has only been detected after death. It is rarely, however, that the occurrence of shock and prostration is not sufficiently distinct to arouse suspicion, even in the absence of the usual marked signs. **Uterine contractions sometimes continue after rupture.** In not a few cases distinct and regular contractions have gone on after laceration, and the child has even been born in the usual way. Of course in such a case mistake is very possible. So curious a circumstance is difficult of explanation. The most probable way of accounting for it is, that the laceration has not implicated the fundus of the uterus, which contracted sufficiently energetically to expel the fœtus. Hence it will be seen that the symptoms are occasionally obscure, and the practitioner must be careful not to overlook the occurrence of so serious an accident, because of the absence of the usual and characteristic symptoms.

Prognosis. The prognosis is necessarily of the gravest possible character, but modern views as to treatment perhaps justify us in saying that it is not so absolutely hopeless as has been generally taught in our obstetric works. **To the mother.** When we reflect on what has occurred—the profound nervous shock; the profuse hæmorrhage, both external, and especially into the peritoneal cavity, where the blood coagulates and forms a foreign body; the passage of the uterine contents into the abdomen, with the inevitable result of inflammation and its consequences, if the patient survive the primary shock—the enormous fatality need cause no surprise. Jolly has found that out of 580 cases 100 recovered—that is, in the proportion of 1 out of 6. This is a far more favourable result than we are

generally led to anticipate; and as many of the recoveries happened in apparently the most desperate and unfavourable cases, we should learn the lesson that we need not abandon all hope, and should at least endeavour to rescue the patient from the terrible dangers to which she is exposed.

As regards the child, the prognosis is almost necessarily fatal; and, indeed, the cessation of the foetal heart-sounds has been pointed out by McClintock as a sign of rupture in doubtful cases. The shock, the profuse hæmorrhage, and the time that must necessarily elapse before the delivery of the child, are of themselves quite sufficient to explain the fact that the foetus is almost always dead. *To the child.*

From what has been said of the impossibility of foretelling the occurrence of rupture, it must follow that no reliable prophylactic treatment can be adopted, beyond that which is a matter of general obstetric principle, viz. timely interference when the uterine contractions seem incapable of overcoming an obstacle to delivery, either on the part of the pelvis or foetus. *Treatment.*

After rupture the main indications are to effect the removal of the child and the placenta, to rally the patient from the effects of the shock, and, if she survives so long, to combat the subsequent inflammation and its consequences. By far the most important point to decide is the best means to be adopted for the removal of the child; for it is admitted by all that the hopeless expectancy that was recommended by the older accoucheurs, or, in other words, allowing the patient to die, without making any effort to save her, is quite inadmissible. If the foetus be entirely within the uterine cavity, no doubt the proper course to pursue is to deliver at once *per vias naturales*, either by turning, by forceps, or by cephalotripsy. If any part other than the head present, turning will be best, great care being taken to avoid further increase of the laceration. If the head be in the cavity or at the brim of the pelvis, and within easy reach of the forceps, it may be cautiously applied, the child being steadied by abdominal pressure, so as to facilitate its application. If there be, as is often the case, some slight amount of pelvic contraction, it may be preferable to perforate and apply the cephalotribe, so as to avoid any forcible attempts at extraction, which might unduly exhaust the already prostrate patient, *Indications after rupture has taken place.* *Management if the foetus remains within the uterus.*

and turn the scale against her. This will be the more allow-
able since the child is, as we have seen, almost always dead,
and we might readily ascertain if it be so by auscultation.

Removal of the placenta.

After delivery extreme care must be taken in removing
the placenta, and for this it will be necessary to introduce
the hand. The placenta will generally be in the uterus, for
if the rent be not large enough for the child to pass through,
it may be inferred that the placenta will not have done so
either. If it has escaped from the uterus, very gentle
traction on the cord may bring it within reach of the hand,
and so the passage of the hand through the tear to search for
it will be avoided.

Treatment when the fœtus has escaped out of the uterus.

There can be but little doubt that, in the cases indicated,
such is the proper treatment, and that which affords the
mother the best chance. Unfortunately, the cases in which
the child remains entirely in utero are comparatively un-
common, and generally it will have escaped into the abdomen,
along with much extravasated blood. The usual plan of
treatment recommended, under such circumstances, is to
pass the hand through the fissure (some have even recom-
mended that it should be enlarged by incision if necessary),
to seize the feet of the fœtus, to drag it back through the
torn uterus, and then to reintroduce the hand to search for
and remove the placenta. Imagine what occurs during the
process. The hand gropes blindly among the abdominal
viscera, the forcible dragging back of the fœtus necessarily
tears the uterus more and more, and, above all, the extrava-
sated blood remains as a foreign body in the peritoneal
cavity, and necessarily gives rise to the most serious conse-
quences. It is surely hardly a matter of surprise that there
is scarcely a single case on record of recovery after this
procedure.

Reasons why gastrotomy affords a better chance of success.

Of late years a strong feeling has existed that, whenever
the child has entirely, or in great part, escaped into the
abdominal cavity, the operation of gastrotomy affords the
mother a far better chance of recovery; and it has now been
performed in many cases with the most encouraging results.
It is easy to see why the prospects of success are greater.
The uterus being already torn, and the peritoneum opened,
the only additional danger is the incision of the abdominal
parietes, which gives us the opportunity of sponging out the

peritoneal cavity, as in ovariotomy, and of removing all the extravasated blood, the retention of which so seriously adds to the dangers of the case. Another advantage is that, if the patient be excessively prostrate, the operation may be delayed until she has somewhat rallied from the effects of the shock, whereas delivery by the feet is generally resorted to as soon as the rupture is recognised, and when the patient is in the worst possible condition for interference of any kind.

Jolly has carefully tabulated the results of the various methods of treatment, and, making every allowance for the unavoidable errors of statistics, it seems beyond all question that the results of gastrotomy are so greatly superior to those of other plans that I think its adoption may fairly be laid down as a rule whenever the fœtus is no longer within the uterine cavity. *Comparative results of various methods of treatment.*

COMPARATIVE RESULTS OF VARIOUS METHODS OF TREATMENT AFTER RUPTURE OF UTERUS.

Treatment	No. of Cases	Deaths	Recoveries	Percent. of Recoveries
Expectation	144	142	2	1·45
Extraction *per vias naturales* .	382	310	72	19
Gastrotomy	38	12	26	68·4

Of course this table will not justify the conclusion that 68 per cent. of the cases of ruptured uterus in which gastrotomy is performed will recover; but it may fairly be taken as proving that the chances of recovery are at least three or four times as great as when the more usual practice is adopted.[1]

Porro's operation has been suggested instead of simple gastrotomy. In seven cases tabulated by Godson, in which this operation was performed after rupture of the uterus, the *Porro's operation.*

[1] *American Puerperal Laparotomies.*—After a search of several years, I have thus far collected 40 cases in the United States, with 21 women and 2 children saved. One mother and child were saved by an immediate operation with a pocket-knife, in 1869. I presume that a general record of American operations published and unpublished would show a saving of about 50 per cent., which is much lower than that claimed by Trask and Jolly, collected from published reports, and less than I thought myself a year ago. Take Trask's foreign cases, 20, and our own 40, and we have native and foreign, 60, with 37 recoveries and 23 deaths. I look upon our own statistics as much more reliable, because many of the unpublished cases were searched out by correspondence. --Harris's note to third American edition.

mothers all died ;[1] but this does not prove that this plan, which
adds little to the dangers of the case, should not be adopted.
It has, at least, the advantage of effectually preventing the
possibility of the recurrence of rupture in a future pregnancy.

Lacera-
tions of
the cervix.

Lacerations of the cervix are of very common occurrence.
Occasionally, after delivery, they may cause hæmorrhage,
when the uterus itself is firmly contracted ; or secondary
hæmorrhage during the puerperal month. As a rule they
are not recognised, and it is only of late years, chiefly
owing to the labours of Emmet, that their important in-
fluence in producing various chronic forms of uterine disease
has been realised. In the large majority of cases the lacera-
tions are lateral, either on one or both sides of the cervix.
If they give rise to hæmorrhages, the local application of
styptics is probably the best resource. Whether it is advis-
able to treat severe forms by the immediate application of
silver sutures, as recommended by Pallen,[2] is a subject as yet
too little understood to justify the expression of an opinion.

Necessity
of care in
perform-
ing the
operation.

It is perhaps needless to say that the operation must be
performed with the same minute care that has raised ovario-
tomy to its present pitch of perfection, and that especial
attention should be paid to the sponging out of the perito-
neum, and the removal of foreign matters.

Recapitu-
lation.

To recapitulate, I think what has been said justifies the
following rules of treatment after rupture :—

1. If the head or presenting part be above the brim, and
the fœtus still in utero—forceps, turning, or cephalotripsy
according to circumstances.

2. If the head be in the pelvic cavity—forceps or cepha-
lotripsy.

3. If the fœtus have wholly, or in great part, escaped
into the abdominal cavity—gastrotomy.

Subse-
quent
treatment.

As to the subsequent treatment, little need be said, since
in this we must be guided by general principles. The chief
indication will be to remove shock and rally the patient by
stimulants, &c., and to combat secondary results by opiates
and other appropriate remedies.

Drainage has been recommended in cases in which

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[1] A successful case has recently been reported by Professor Slavjansky,
of St. Petersburg.

[2] *Transactions of the Intern. Med. Congr.* v. 4.

gastrotomy has not been resorted to, and the results are said to have been good. Mann [1] advises that a large piece of drainage tube should be bent in the middle, at which point a free opening should be made. This bent portion is passed for about half an inch through the laceration, the lower limbs fastened together, projecting beyond the vulva, and covered with an antiseptic dressing. After 48 hours the wound should be regularly irrigated with 2 per cent. solution of carbolic acid.

Lacerations of the vagina occasionally take place, and in the great majority of cases they are produced by instruments, either from a want of care in their introduction, or from undue stretching of the vaginal walls during extraction with the forceps. Slight vaginal lacerations are probably much more common after forceps delivery than is generally believed to be the case. As a rule, they are productive of no permanent injury, although it must not be forgotten that every breach of continuity increases the risk of subsequent septic absorption. When the laceration is sufficiently deep to tear through the recto-vaginal septum, or the anterior vaginal wall, the passage of the urine or fæces is apt to prevent its edges uniting; then that most distressing condition, recto-vaginal, or vesico-vaginal, fistula is established. *Lacerations of the vagina. Slight vaginal lacerations are of frequent occurrence. In the graver varieties recto-vaginal or vesico-vaginal fistulæ may result.*

It must not be supposed that fistulæ are often the result of injury during operative interference. That is a common but very erroneous opinion both among the profession and the public. In the vast majority of cases the fistulous opening is the consequence of a slough resulting from inflammation, produced by long-continued pressure of the vaginal walls between the child's head and the bony pelvis, in cases in which the second stage has been allowed to go on too long. In most of these cases instruments were doubtless eventually used, and they get the blame of the accident; whereas the fault lay, not in their being employed, but rather in their not having been used soon enough to prevent the contusion and inflammation which ended in sloughing. *Such fistulæ, however, are seldom caused by mechanical injury.*

When vesico-vaginal fistulæ are the result of lacerations during labour, the urine must escape at once, but this is rarely the case. In the large majority of cases the urine does not pass per vaginam until more than a week after delivery, showing that a lapse of time is necessary for in- *Proof of this statement.*

[1] *Centralblatt f. Gynæk.* 1881.

flammatory action to lead to sloughing. In order to throw some light on these points, on which very erroneous views have been held, I have carefully examined the histories, from various sources, of 63 cases of vesico-vaginal fistula.

1st. In 20 no instruments were employed. Of these, there were in labour under 24 hours   .   2

from 24 to 48 hours   .   .   8[1]

„   40 to 70   „   .   .   2

„   70 to 80   „   .   .   7

„   80 hours and upwards   .   1

——

20

Therefore out of these 20 cases one-half were certainly more than 48 hours in labour, and 6 of the remaining 10 were probably so also. In only one of them is the urine stated to have escaped per vaginam immediately after delivery. In 7 it is said to have done so within a week, and in the remainder after the seventh day.

2nd. In 34 cases instruments were used, but there is no evidence of their having produced the accident. Of these, there were in labour under 24 hours   .   2

from 24 to 48 hours   .   .   8

„   48 to 72   „   .   .   10

„   72 hours and upwards   .   14

——

34

The urine escaped within 24 hours in 2 cases only, within a week in 16, and after the seventh day in 15.

So that here again we have the history of unduly protracted delivery, 24 out of the 34 having been certainly more than 48 hours in labour.

3rd. In 9 cases the histories show that the production of the fistula may fairly be ascribed to the unskilled use of instruments. Of these there were in labour under 24 hours   7

from 24 to 48 hours   .   .   1

„   48 to 72   „   .   .   1

——

2

---

[1] But of these in 7 no precise time is stated. Six of them are marked *very tedious*, therefore they probably exceeded the limit.

The urine escaped at once in 7 cases, and in the remaining 2 after the seventh day.

These statistics seem to me to prove, in the clearest manner, that, in the large majority of cases, this unhappy accident may be directly traced to the bad practice of allowing labour to drag on many hours in the second stage without assistance, and not to premature instrumental interference. This question has recently been elaborately studied by Emmet, who gives numerous statistical tables which fully corroborate these views. His conclusion, the result of much practical experience of vesico-vaginal fistulæ, is worthy of being quoted. 'I do not hesitate,' he says, 'to make the statement that I have never met with a case of vesico-vaginal fistula which, without doubt, could be shown to have resulted from instrumental delivery. On the contrary, the entire weight of evidence is conclusive in showing that the injury is a consequence of delay in delivery.' [1]

As to the treatment of vaginal laceration little can be said. In the slighter cases vaginal injections of diluted Condy's fluid will be useful to lessen the risk of septic absorption; and the graver, when vesico-vaginal or recto-vaginal fistulæ have actually formed, are not within the domain of the obstetrician, but must be treated surgically at some future date.

Treatment.

[1] *The Principles and Practice of Gynæcology,* p. 669.

CHAPTER XVII.

INVERSION OF THE UTERUS.

Its for-
midable
character.

INVERSION of the uterus shortly after the birth of the child is one of the most formidable accidents of parturition, leading to symptoms of the greatest urgency, not rarely proving fatal, and requiring prompt and skilful treatment. Hence it has obtained an unusual amount of attention, and there are few obstetric subjects which have been more carefully studied.

An acci-
dent of
great
rarity.

Fortunately, the accident is of great rarity. It was only observed once in upwards of 190,800 deliveries at the Rotunda Hospital since its foundation in 1745; and many practitioners have conducted large midwifery practices for a lifetime without ever having witnessed a case. It is none the less needful, however, that we should be thoroughly acquainted with its natural history, and with the best means of dealing with the emergency when it arises.

Division
into acute
and
chronic
forms.

Inversion of the uterus may be met with in the acute or chronic form; that is to say, it may come under observation either immediately or shortly after its occurrence, or not until after a considerable lapse of time, when the involution following pregnancy has been completed. The latter falls more properly under the province of the gynæcologist, and involves the consideration of many points that would be out of place in a work on obstetrics. Here, therefore, the acute form alone is considered.

Descrip-
tion of
inversion.

Inversion consists essentially in the enlarged and empty uterus being turned inside out, either partially or entirely; and this may occur in various degrees, three of which are usually described, and are practically useful to bear in mind. In the first and slightest degree there is merely a cup-shaped

depression of the fundus (fig. 145); in the second the depression is greater, so that the inverted portion forms an intro-susception, as it were, and projects downwards through the os in the form of a round ball, not unlike the body of a polypus, for which, indeed, a careless observer might mistake it; and, thirdly, there is the complete variety, in which the whole organ is turned inside out, and may even project beyond the vulva.

Fig. 145.
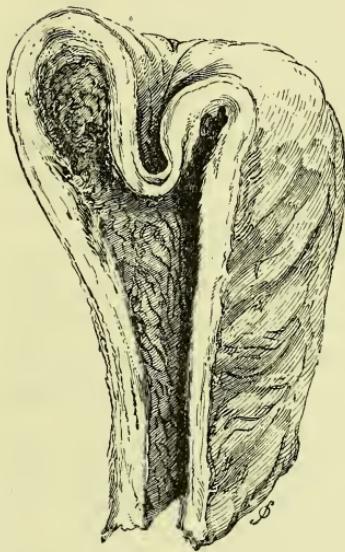
PARTIAL INVERSION OF THE FUNDUS.
(From a preparation in the Museum of Guy's Hospital.)

The symptoms are generally very characteristic, although, when the amount of inversion is small, they may entirely escape observation. They are chiefly those of profound nervous shock, viz., fainting, small, rapid, and feeble pulse, possibly convulsions and vomiting and a cold, clammy skin. Occasionally severe abdominal pain and bearing down are felt. Hæmorrhage is a frequent accompaniment, sometimes to a very alarming extent, especially if the placenta be partially or entirely detached. The loss of blood depends to a great extent on the condition of the uterine parietes. If there be much contraction on the part that is not inverted, the intro-suscepted part may be sufficiently compressed to prevent any great loss. If the entire organ be in a state of relaxation the loss may be excessive.

Its symptoms.

The occurrence of such symptoms shortly after delivery would of necessity lead to an accurate examination, when the nature of the case may be at once ascertained. On passing the finger into the vagina we either find the entire uterus forming a globular mass—to which the placenta is often attached—or, if the inversion be incomplete, the vagina is occupied by a firm, round, and tender swelling, which can be traced upwards through the os uteri. The hand placed on the abdomen will detect the absence of the round ball of the contracted uterus, the bi-manual examination may even

Results of physical examination.

enable us to feel the cup-shaped depression at the site of inversion.

When such signs are observed immediately after delivery, mistake is hardly possible. Numerous instances, however, are recorded in which the existence of inversion was not immediately detected, and the tumour formed by it only observed after the lapse of several days, or even longer, when the general symptoms led to vaginal examination. It is probable that, in such cases, a partial inversion had taken place shortly after delivery, which, as time elapsed, became gradually converted into the more complete variety. In a case of this kind, as in a chronic inversion, some care is necessary to distinguish the inversion from a uterine polypus, which it closely resembles. The cautious insertion of the sound will render the diagnosis certain, since its passage is soon arrested in inversion, while, if the tumour be polypoid, it readily passes in as far as the fundus.

The mechanism by which inversion is produced is well worthy of study, and has given rise to much difference of opinion.

A very general theory is that it is caused, in many cases, by mismanagement of the third stage of labour, either by traction on the cord, the placenta being still adherent, or by improperly applied pressure on the fundus; the result of both these errors being a cup-shaped depression of the fundus which is subsequently converted into a more complete variety of inversion. That such causes may suffice to start the inversion cannot be doubted, but it is probable that their frequency has been much exaggerated. Still there are numerous recorded cases in which the commencement of the inversion can be traced to them. Improperly applied pressure (as when the whole body of the uterus is not grasped in the hollow of the hand, but when a monthly nurse, or other uninstructed person, presses on the lower part of the abdomen, so as simply to push down the uterus *en masse*) is often mentioned in histories of the accident. Thus, in the 'Edinburgh Medical Journal' for June 1848, a case is related in which the patient would not have a medical man, but was attended by a midwife, who, after the birth of the child, pulled on the cord, while the patient herself clasped her hands and pushed down her abdomen, at the same time

straining forcibly, when the uterus became inverted and the patient died of hæmorrhage before assistance could be procured. Here both of the mechanical causes mentioned were in operation. In several cases it is mentioned that the accident occurred while the nurse was compressing the abdomen. That the accident is practically impossible when firm and equable contraction has taken place cannot be questioned. Hence it is of paramount importance that the practitioner should himself carefully attend to the conduct of the third stage of labour.

In a large proportion of cases no mechanical causes can be traced, and the occurrence of spontaneous inversion must be admitted. There are various theories held as to how this occurs. Partial and irregular contraction of the uterus is generally admitted to be an important factor in its production : but it is still a matter of dispute whether the inversion is produced mainly by an active contraction of the fundus and body of the uterus, the lower portion and cervix being in a state of relaxation ; or whether the precise reverse of this exists, the fundus being relaxed and in a state of quasi-paralysis, while the cervix and lower portion of the uterus are irregularly contracted. The former is the view maintained by Radford and Tyler Smith, while the latter is upheld by Matthews Duncan.

Often occurs spontaneously.

There are good clinical reasons for believing that Duncan's view more nearly corresponds with the true facts of the case ; for, if the fundus and body of the uterus be really in a state of active contraction, while the cervix is relaxed, we have, as Duncan points out, the very condition which is normal and desirable after delivery, and that which we do our best to produce. If, however, the opposite condition exist, and the fundus be relaxed, while the lower portion is spasmodically contracted, a state exists closely allied to the so-called hour-glass contraction. Supposing now any cause produces a partial depression of the fundus, it is easy to understand how it may be grasped by the contracted portion, and carried more and more down, in the manner of an intro-susception, until complete inversion results. That such partial paralysis of the uterine walls often exists, especially about the placental site, was long ago pointed out by Rokitansky and other pathologists. This theory supposes the original partial

Evidence in favour of Duncan's theory.

depression and relaxation of the fundus. How this is often produced by mismanagement of the third stage has already been pointed out; but, even in the absence of such causes, it may result from strong bearing-down efforts on the part of the patient; or, as Duncan holds, from the absence of the retentive power of the abdomen. Indeed, the incompatibility of an actively contracted state of the fundus with the partial depression which is essential according to both views, for the production of inversion, is the strongest argument in favour of Duncan's theory.

Taylor's theory.

A totally different view has more recently been sustained by Dr. Taylor, of New York, who maintains that 'spontaneous active inversion of the uterus rests upon prolonged natural and energetic action of the body and fundus; the cervix, the lower part, yielding first, is thus rolled out, or everted, or doubled up, as there is no obstruction from the contractility of the cervix, which is at rest or functionally paralysed; the body is gradually, sometimes instantaneously, forced lower and lower, or inverted.'[1] That partial inversion may commence at the cervix was pointed out by Duncan in his paper, who depicts it in the accompanying diagram (fig. 146),

Fig. 146.

ILLUSTRATING THE COMMENCEMENT OF INVERSION AT THE CERVIX.
(After Duncan.)

and states it to be of not unfrequent occurrence. It is not impossible that occasionally such a state of things should be carried on to complete inversion. But there are serious objections to the acceptance of Dr. Taylor's view that such is the principal cause of inversion, since the process above described would be of neccessity a slow and long-continued one, whereas nothing is more certain than that inversion is generally sudden and accompanied by acute symptoms of shock, and is often attended by severe hæmorrhage, which could not occur when such excessive contraction was taking place.

[1] *New York Med. Jour.* 1872.

The treatment of inversion consists in restoring the organ to its natural condition as soon as possible. Every moment's delay only serves to render restoration more difficult, as the inverted portion becomes swollen and strangulated; whereas if the attempt at reposition be made immediately, there is generally comparatively little difficulty in effecting it. Therefore, it is of the utmost importance that no time should be lost, and that we should not overlook a partial or incomplete inversion. Hence the occurrence of any unusual shock, pain, or hæmorrhage after delivery, without any readily ascertained cause, should always lead to a careful vaginal examination. A want of attention to this rule has too often resulted in the existence of partial inversion being overlooked until its reduction was found to be difficult or impossible. *Treatment.*

Importance of not overlooking partial inversion.

In attempting to reduce a recent inversion, the inverted portion of the uterus should be grasped in the hollow of the hand and pushed gently and firmly upwards into its natural position, great care being taken to apply the pressure in the proper axis of the pelvis, and to use counter-pressure, by the left hand, on the abdominal walls. Barnes lays stress on the importance in directing the pressure towards one side so as to avoid the promontory of the sacrum. The common plan of endeavouring to push back the fundus first has been well shown by McClintock[1] to have the disadvantage of increasing the bulk of the mass that has to be reduced, and he advises that, while the fundus is lessened in size by compression, we should, at the same time, endeavour to push up first the part that was less inverted, that is to say, the portion nearest the os uteri. Should this be found impossible, some assistance may be derived from the manœuvre, recommended by Merriman and others, of first endeavouring to push up one side or wall of the uterus, and then the other, alternating the upward pressure from one side to the other as we advance. It often happens, as the hand is thus applied, that the uterus somewhat suddenly re-inverts itself, sometimes with an audible noise, much as an india-rubber bottle would do under similar circumstances. When reposition has taken place the hand should be kept for some time in the uterine cavity to excite tonic contraction; or a stream of hot water at 110° F. may be injected, and if that fails a weak *Mode of attempting reduction.*

[1] *Diseases of Women,* p. 79.

solution of perchloride of iron, so as to cause tonic contraction of the uterus and thus prevent a recurrence of the accident.

It is hardly necessary to point out how much these manœuvres will be facilitated by placing the patient fully under the influence of an anæsthetic.

Management of the placenta. There has been much difference of opinion as to the management of the placenta in cases in which it is still attached when inversion occurs. Should we remove it before attempting reposition, or should we first endeavour to re-invert the organ, and subsequently remove the placenta? The removal of the placenta certainly much diminishes the bulk of the inverted portion, and, therefore, renders reposition easier. On the other hand, if there be much hæmorrhage, as is so frequently the case, the removal of the placenta may materially increase the loss of blood. For this reason most authorities recommend that an endeavour should be made at a reduction before peeling off the after-birth. But if any delay or difficulty be experienced from the increased bulk, no time should be lost, and it is in every way better to remove the placenta and endeavour to re-invert the organ as soon as possible.

Management of cases detected some time after delivery. Supposing we met with a case in which the existence of inversion has been overlooked for days, or even for a week or two, the same procedure must be adopted; but the difficulties are much greater, and the longer the delay the greater they are likely to be. Even now, however, a well-conducted attempt at taxis is likely to succeed. Should it fail, we must endeavour to overcome the difficulty by continuous pressure applied by means of caoutchouc bags, distended with water, and left in the vagina. It is rarely that this will fail in a comparatively recent case, and such only are now under consideration. It is likely that by pressure, applied in this way for twenty-four or forty-eight hours, and then followed by taxis, any case detected before the involution of the uterus is completed may be successfully treated.

PART IV.

OBSTETRIC OPERATIONS.

CHAPTER I.

INDUCTION OF PREMATURE LABOUR.

THE first of the obstetric operations we have to consider is the *induction of premature labour*, an operation which, like the use of forceps, was first suggested and practised in this country, and the recognition of which, as a legitimate procedure, we also chiefly owe to the labour of our fellow-countrymen, in spite of much opposition both at home and abroad.   It is not known with certainty to whom we owe the original suggestion, but we are told by Denman that in the year 1756 there was a consultation of the most eminent physicians at that time in London, to consider the advantages which might be expected from the operation.   The proposal met with formal approval, and was shortly after carried into practice by Dr. Macaulay, the patient being the wife of a linendraper in the Strand.   From that time it has flourished in Great Britain, the sphere of its application has been largely increased, and it has been the means of saving many mothers and children who would otherwise, in all probability, have perished.   On the Continent it was long before the operation was sanctioned or practised.   Although recommended by some of the most eminent German practitioners, it was not actually performed until the year 1804.   In France the opposition was long-continued and bitter.   Many of the leading teachers strongly denounced it, and the Academy of Medicine formally discountenanced it so late as the year 1827.   The objections were chiefly based on religious grounds, but partly, no doubt, on mistaken notions as to

<div style="text-align: right">History of the operation.</div>

the object proposed to be gained. Although frequently discussed, the operation was never actually carried into practice until the year 1831, when Stoltz performed it with success. Since that time opposition has greatly ceased, and it is now employed and highly recommended by the most distinguished obstetricians of the French schools.

Objects of the operation. It may be performed either on account of the mother or child alone, or of both.

In inducing premature labour, we propose to avoid or lessen the risk to which, in certain cases, the mother is exposed by delivery at term, or to save the life of the child which might otherwise be endangered. Hence the operation may be indicated either on account of the mother alone, or of the child alone, or, as not unfrequently happens, of both together.

Defective proportion between the child and pelvis is the most frequent indication.

In by far the largest number of cases the operation is performed on account of defective proportion between the child and the maternal passages, due to some abnormal condition on the part of the mother. This want of proportion may depend on the presence of tumours either of the uterus or growing from the pelvis. But most frequently it arises from deformity of the pelvis (p. 82), and it is needless to repeat what has been said on that point. I shall, therefore, only briefly refer to a few more uncommon causes, which occasionally necessitate its performance.

Habitually large size of the fœtal head.

One of these is an habitually large, or over-firmly ossified, fœtal head. Should we meet with a case in which the labours are always extremely difficult, and the head apparently of unusual size, although there is no apparent want of space in the pelvis, the induction of labour would be perfectly justifiable, and in all probability would accomplish the desired object. In such cases the full period of delivery would require to be anticipated by a very short time. A week or a fortnight might make all the difference between a labour of extreme severity and one of comparative ease.

Condition of the mother's health calling for the operation.

There is a large class of cases in which the condition of the mother indicates the operation. Many of these have already been considered when treating of the diseases of pregnancy. Amongst them may be mentioned vomiting which has resisted all treatment, and which has produced a state of exhaustion threatening to prove fatal ; chorea, albuminuria, convulsions, or mania ; excessive anasarca, ascites, or dyspnœa connected with disease of the heart, lungs, or

liver, which may be, in a great measure, caused by the pressure of the enlarged uterus; in fact, any condition or disease affecting the mother, provided only we are convinced that the termination of pregnancy would give the patient relief, and that its continuance would involve serious danger. It need hardly be pointed out that the induction of labour for any such causes involves grave responsibility, and is decidedly open to abuse; no practitioner would, therefore, be justified in resorting to it—especially if the child have not reached a viable age—without the most anxious consideration. No general rules can be laid down. Each case must be treated on its own merits. It is obvious that the nearer the patient is to the full period, the greater will be the chance of the child surviving, and the less hesitation need then be felt in consulting the interest of the mother.

In another class of cases the operation is indicated by circumstances affecting the life of the child alone. Of these the most common are those in which the child dies, in several successive pregnancies, before the termination of utero-gestation. This is generally the result of fatty, calcareous, or syphilitic degeneration of the placenta, which is thus rendered incapable of performing its functions. These changes in the placenta seldom commence until a comparatively advanced period of pregnancy; so that if labour be somewhat hastened we may hope to enable the patient to give birth to a living and healthy child. The experience of the mother will indicate the period at which the death of the fœtus has formerly taken place, as she would then have appreciated a difference in her sensations, a diminution in the vigour of the fœtal movements, a sense of weight and coldness, and similar signs. For some weeks before the time at which this change has been experienced, we should carefully auscultate the fœtal heart from day to day, and, in most cases, the approach of danger will be indicated sufficiently soon to enable us to interfere with success, by tumultuous and irregular pulsations, or a failure in their strength and frequency. On the detection of these, or on the mother feeling that the movements of the child are becoming less strong, the operation should at once be performed. Simpson also induced premature labour with success in a patient who had twice given birth to hydrocephalic children. In the third

Conditions affecting the safety of the child alone.

pregnancy, which he terminated before the natural period, the child was well-formed and healthy.

Induction of labour when the mother is mortally ill.

Some obstetricians have proposed to induce labour, with the view of saving the child, when the mother was suffering from mortal disease. This indication is, however, so extremely doubtful, from a moral point of view, that it can hardly be considered as ever justifiable.

Various methods of inducing labour; their mode of action.

The means adopted for the induction of labour are very numerous. Some of them act through the maternal circulation, as the administration of ergot, and other oxytocics; others by their power of exciting reflex action, or by interfering with the integrity of the ovum, or by a combination of both, as the vaginal douche, separation of the membranes from the uterine walls, puncture of the ovum, dilatation of the os, stimulating enemata, or irritation of the breasts. The former class are never employed in modern obstetric practice. Of the latter, some offer special advantages in particular cases, but none are equally adapted for all emergencies. Often a combination of more methods than one will be found most useful. I shall mention the various methods in use, and discuss briefly the relative advantages and disadvantages of each.

Puncture of membranes.

The evacuation of the liquor amnii, by the puncture of the membranes, was the first method practised, and was that recommended by Denman and all the earlier writers. It is the most certain which can be employed, as it never fails, sooner or later, to induce uterine contractions. There are however, several disadvantages connected with it which are sufficient to contra-indicate its use in the majority of cases. It is uncertain as regards the time taken in producing the desired effect, pains sometimes coming on within a few hours, but occasionally not until several days have elapsed. The contracting walls of the uterus press directly on the body of the child, which, being frail and immature, is less able to bear the pressure than at the full period of pregnancy. Hence it involves great risk to the fœtus. Besides, the escape of the water does away with the fluid wedge so useful in dilating the os, and should version be necessary from mal-presentation—a complication more likely to occur than in natural labour—the operation would have to be performed under very unfavourable conditions. These objections are sufficient

to justify the ordinary opinion that this procedure should not be adopted, unless other means have been tried and failed. Every now and then cases are met with in which it is extremely difficult to arouse the uterus to action, and under such circumstances, in spite of its drawbacks, this method will be found to be very valuable. When the operation has to be performed before the child is viable, that is, before the seventh month, these objections do not hold, and then it is the simplest and readiest procedure we can adopt. Indeed, in producing early abortion, no other is practicable. The operation itself is most simple, requiring only a quill, stiletted catheter, or other suitable instrument, to be passed up to the os, carefully guarded by the fingers of the left hand previously introduced, and to be pressed against the membranes until perforation is accomplished. Meissner, of Leipsic, has proposed as a modification of this plan, that the membranes should be punctured obliquely, three or four inches above the os, so as to admit of a gradual and partial escape of the amniotic fluid, thus lessening the risk to the child from pressure by the uterus. For this purpose he employed a curved silver canula, containing a small trocar, which can be projected after introduction. The risk of injuring the uterus by such an instrument would be considerable, and we have other and better means at our command which render it unnecessary. When we require to produce early abortion, it would be well not to attempt to puncture the membranes with a sharp-pointed instrument. The object can be effected with certainty, and greater safety, by passing an ordinary uterine sound through the os, and turning it round once or twice.

The administration of ergot of rye, either alone or combined with borax and cinnamon, has been sometimes resorted to. This practice has been principally advocated by Ramsbotham, who was in the habit of exhibiting scruple doses of the powdered ergot every fourth hour, until delivery took place. Sometimes he found that as many as thirty or forty doses were required to effect the object; occasionally labour commenced after a single dose. Finding that the infantile mortality was very great when this method was followed, he modified it, and administered two or three doses only, and, if these proved insufficient, he punctured the membranes. *Administration of oxytocics.*

There can be no doubt that ergot possesses the power of inducing uterine contractions. The risk to the child is, however, quite as great as when the membranes are punctured; for not only is it subject to injurious pressure from the tumultuous and irregular contractions which the ergot produces, but the drug itself, when given in large doses, seems to exert a poisonous influence on the fœtus. For these reasons ergot may properly be excluded from the available means of inducing labour.

Methods acting indirectly on the uterus.
Various methods have been recommended which act indirectly on the uterus, the source of irritation being at a distance. Thus D'Outrepont used frequently repeated abdominal frictions and tight bandages. Scanzoni, remembering the intimate connection between the mammæ and uterus, and the tendency which irritation of the former has to induce contraction of the latter, recommended the frequent application of cupping-glasses to the breasts. Radford and others have employed galvanism. Stimulating enemata have been employed. All these methods have occasionally proved successful, and, unlike the former plans we have mentioned, they are not attended by any special risk to the child. They are, however, much too uncertain to be relied on, besides being irksome both to the patient and practitioner.

Artificial dilatation of the os uteri.
The artificial dilatation of the os uteri in imitation of its natural opening in labour was first practised by Klüge. He was in the habit of passing within the os a tent made of compressed sponge, and allowing it to dilate by imbibition of fluid. If labour were not provoked within twenty-four hours he removed it, and introduced one of larger dimensions, changing it as often as was necessary until his object was accomplished. Although this operation seldom failed to induce labour, it had the disadvantage of occupying an indefinite time, and the irritation produced was often painful and annoying. Dr. Keiller, of Edinburgh, was the first to suggest the use of caoutchouc bags, distended by air, as a means of dilating the os. This plan has been perfected by Dr. Barnes in his well-known dilators, which are of great use in many cases in which artificial dilatation of the cervix is necessary. They consist of a series of india-rubber bags of various sizes, with a tube attached (fig. 147), through which water can be injected by an ordinary Higginson's syringe.

They have a small pouch fixed externally, in which a sound can be placed, so as to facilitate their introduction. When distended with water the bags assume somewhat of a fiddle shape, bulging at both extremities, which insures their being retained within the os. When first introduced into practice as a means of inducing labour, it was thought that this method gave a complete control over the process, so that it could be concluded within a definite time at the will of the operator. The experience of those who have used it much

Fig. 147.

BARNES'S BAG FOR
DILATING THE
CERVIX.

has certainly not justified this anticipation. It is true that, occasionally, contractions supervene within a few hours after dilatation has been commenced; but, on the other hand, the uterus often responds very imperfectly to this kind of stimulus, and the bags may be inserted for many consecutive hours without the desired result supervening; the puncture of the membranes being eventually necessary in order to hasten the process. Indeed, my own experience would lead me to the conclusion that, as a means of evoking uterine contraction, cervical dilatation is very unsatisfactory. Dr. Barnes himself has evidently seen reason to modify his original views, for while he at first talked of the bags as enabling us to induce labour with certainty at a given time, he has since recommended that uterine action should be first provoked by other means, the dilators being subsequently used to accelerate the labour thus brought on. The bags thus employed find, as I believe, their most useful and a very valuable application; but when used in this way they cannot be considered a means of originating uterine action. A subsidiary objection to the bags is the risk of displacing the presenting part. I have, for example, introduced them when the head was presenting, and, on their removal, found the shoulder lying over the os. It is not difficult to understand how the continuous pressure of a distended bag in the internal os might easily push away the head, which is so readily movable so long as the membranes are unruptured. Still, if labour be in progress, and the os insufficiently dilated, the possibility of this occurrence is not a sufficient

reason for not availing ourselves of the undoubtedly valuable assistance which the dilators are capable of giving.

Separation of the membranes.

Some processes for inducing labour act directly on the ovum, by separating the membranes, to a greater or less extent, from the uterine walls. The first procedure of the kind was recommended by Dr. Hamilton, of Edinburgh, and consisted in the gradual separation of the membranes for one or two inches all round the lower segment of the uterus. To reach them the finger had to be gently insinuated into the interior of the os, which was gradually dilated to a sufficient extent by a series of successive operations, repeated at intervals of three or four hours. When this had been accomplished, the forefinger was inserted and swept round between the membranes and the uterus, but it was frequently found necessary to introduce the greater part of the hand to effect the object, and, sometimes, even this was not sufficient, and a female catheter or other instrument had to be used for the purpose. The method was generally successful in bringing on labour, but it now and then failed, even in Dr. Hamilton's hands. It is certainly based on correct principles, but it is tedious and painful both to the practitioner and the patient, and very uncertain in its time of action. For these reasons it has never been much practised.

Vaginal and uterine douches.

In the year 1836 Kiwisch suggested a plan which, from its simplicity, has met with much approval. It consists in projecting, at intervals, a stream of warm or cold water against the os uteri. Its action is doubtless complex. Kiwisch himself believed that relaxation of the soft parts, through the imbibition of water, was the determining cause of labour. Simpson found that the method failed, unless the water mechanically separated the membranes from the uterine walls. Besides this effect it probably directly induces reflex action, by distending the vagina and dilating the os. In using it, it has been customary to adminster a douche twice daily, and more frequently if rapid effects be desired. The number required varies in different cases. The largest number Kiwisch found it necessary to use was 17, the smallest 5. The average time that elapses before labour sets in is four days. Hence the method is obviously useless when rapid delivery is required.

Dr. Cohen, of Hamburg, introduced an important modi-

fication of the process, which has been considerably practised. It consists in passing a silver or gum-elastic catheter some inches within the os, between the membranes and the uterine walls, and injecting the fluid through it directly into the cavity of the uterus. He used creasote, or tar water, and injected, without stopping, until the patient complained of a feeling of distension. Others have found the plan equally efficacious when they only employed a small quantity of plain water, such as 7 or 8 ounces. Professor Lazarewitch, of Charkoff, is a strong advocate of this method. He believes that uterine action is evoked much more rapidly and certainly if the water be injected near the fundus, and he has contrived an instrument for the purpose, with a long metallic nozzle.

So many fatal cases have followed these methods, that it cannot be doubted that, in spite of their certainty and simplicity, there is an element of risk in them that should not be overlooked. Many of these are recorded in Barnes's work, and he comes to the conclusion, which the facts unquestionably justify, that ' the douche, whether vaginal or intra-uterine, ought to be absolutely condemned as a means of inducing labour.' The precise reason of the danger is not very obvious. Sudden stretching of the uterine walls, producing shock, has been supposed to have caused it; but in many of the fatal cases the symptoms have been rather those attending the passage of air into the veins, and it is easy to understand how air may have been introduced, in this way, into the large uterine sinuses. *Dangers of these plans.*

Simpson and Scanzoni have both tried with success the injection of carbonic acid gas into the vagina. Fatal results have, however, followed its employment, and Simpson has expressed an opinion that the experiment should not be repeated. *Injection of carbonic acid gas.*

Simpson originally induced labour by passing the uterine sound within the os, and up towards the fundus, and, when it has been inserted to a sufficient extent, moving it slightly from side to side. He was led to adopt this procedure in the belief that we might thus closely imitate the separation of the decidua, which occurs previous to labour at term. Uterine contractions were induced with certainty and ease, but it was found impossible to foretell what time might *Simpson's method of operating.*

elapse between the commencement of labour and the opera-
tion, which had frequently to be performed more than once.

He subsequently modified this procedure by introducing a
flexible male catheter, without a stilette, which he allowed to
remain in the uterus until contractions were excited. This
plan is much used in Germany, and is now that which is also
most frequently adopted in this country. It is simple and
very efficacious, pains coming on, almost invariably, within
24 hours after the catheter or bougie is introduced. A theo-
retical objection is the possibility of the catheter separating
a portion of the placenta and giving rise to hæmorrhage ;
but in practice this has not been found to occur, and the risk
might generally be avoided by introducing the catheter at a
distance from the placenta, the probable situation of which
has been ascertained by auscultation. The more deeply the
catheter is introduced, the more certain and rapid is its
effect, and not less than 7 inches should be pushed up within
the os. It is not always easy to insert it so far, especially if
a flexible catheter be used, which is apt to be too pliable
to pass upwards with ease. A solid bougie—male urethral
bougie—should, therefore, be employed, and I have found its
introduction greatly facilitated by anæsthetising the patient
and passing the greater part of the hand into the vagina.
In this way it can be pushed in very gently, and without
any risk of injury to the uterus. There is some chance of
rupturing the membranes while pushing it upwards. This
accident, indeed, cannot always be avoided, even when
the greatest care is taken ; but when it occurs, the punc-
ture will be at a distance from the os, so that a small por-
tion only of the liquor amnii will escape, and this can
scarcely be considered a serious objection. It is always an
advantage to allow the pains to come on gradually, and in
imitation of natural labour. Therefore, if, after the bougie
has been inserted for a sufficient time, uterine contractions
come on sufficiently strongly, we may leave the case to be
terminated naturally ; or, if they be comparatively feeble,
we may resort to accelerative procedures, viz., dilatation
of the cervix by the fluid bags, and subsequently the
puncture of the membranes. In this way we have the
labour completely under control ; and I believe this method
will commend itself to those who have experience of it, as the

simplest and most certain mode of inducing labour yet known, and the one most closely imitating the natural process. Of late I have been in the habit of combining dilatation of the cervix with this method, by means of a well-carbolised sponge tent passed into the cervix after the bougie is in position. In ten or twelve hours, when the tent and bougie are removed, the cervix is found well dilated, and ready for the passage of the child.

It should not be forgotten that the child is immature, and that unusual care is likely to be required to rear it successfully. We should, therefore, be careful to have at hand all the usual means of resuscitation; and, as the mother may not be able to nurse at once, it would be a good precaution to have a healthy wet nurse in readiness.

The child is immature and difficult to rear.

CHAPTER II.

TURNING.

History of the operation.

TURNING, by which we mean the alteration of the position of the fœtus, and the substitution of some other portion of the body for that originally presenting, is one of the most important of obstetric operations, and merits careful study. It is also one of the most ancient, and was evidently known to the Greek and Roman physicians. Up to the fifteenth century, cephalic version—that in which the head of the fœtus is brought over the os uteri—was almost exclusively practised, when Paré and his pupil Guillemeau taught the propriety of bringing the feet down first. It was by the latter physician especially that the steps of the operation were clearly defined; and the French have undoubtedly the merit both of perfecting its performance, and of establishing the indications which should lead to its use. Indeed, it was then much more frequently performed than in later times, since no other means of effecting artificial delivery were known, which did not involve the death of the child; and practitioners, doubtless, acquired great skill in its performance, and were inclined to overrate its importance, and extend its use to unsuitable cases. An opposite error was fallen into after the invention of the forceps, which for a time led to the abandonment of turning in certain conditions for which it was well adapted, and in which it has only of late years been again practised.

Cephalic version.

Cephalic version has, since Paré wrote, been recommended and practised from time to time, but the difficulty of performing it satisfactorily was so great that it never became an established operation. Dr. Braxton Hicks has perfected a method by which it can be accomplished with greater ease and certainty, and which renders it a legitimate and satis-

factory resort in suitable cases. To whom we are also indebted for introducing a method of turning without passing the entire hand into the cavity of the uterus, which, under favourable circumstances, is not only easy of performance, but deprives the operation of one of its greatest dangers.

The possibility of effecting version by external manipulation has been long known, and was distinctly referred to and recommended by Dr. John Pechey,[1] so far back as the year 1698. Since that time it has been strongly advocated by Wigand and his followers; and various authors in this country, notably Sir James Simpson, have referred to the advantage to be derived from external manipulation assisting the hand in the interior of the uterus. In 1854 Dr. Wright, of Cincinnati, advocated the application of the bi-manual method in arm and shoulder presentations, chiefly with the view of effecting cephalic version. To Dr. Hicks, however, incontestably belongs the merit of having been the first distinctly to show the possibility of effecting complete version in all cases in which the operation is indicated by combined external and internal manipulation, of laying down definite rules for its practice, and for thus popularising one of the greatest improvements in modern midwifery. *Turning by external and internal manipulation.*

The operation is entirely dependent for success on the fact that the child in utero is freely movable, and that its position may be artificially altered with facility. As long as the membranes are unruptured, and the fœtus is floating in the surrounding fluid medium, it is liable to constant changes in position, as may be readily demonstrated in the latter months of pregnancy; and the operation, under these circumstances, may be performed with the greatest facility. Shortly after the liquor amnii has escaped there is still, as a rule, no great difficulty in effecting version; but, as the body is no longer floating in the surrounding liquid, its rotation must necessarily be attended with some increased risk of injury to the uterus. If the liquor amnii have been long evacuated, and the muscular structure of the uterus be strongly contracted, the fœtus may be so firmly fixed, that any attempt to move it is surrounded with the greatest difficulties, and may even fail entirely, or be attended with such risks to the maternal structures as to be quite unjustifiable. *Object and nature of the operation.*

[1] *The Complete Midwife's Practice*, p. 142.

Cases suitable for the operation.

Version may be required either on account of the mother or child alone ; or it may be indicated by some condition imperilling both, and rendering immediate delivery necessary. The chief cases in which it is resorted to are those of transverse presentation, where it is absolutely essential ; accidental or unavoidable hæmorrhage ; certain cases of contracted pelvis ; and some complications, especially prolapse of the funis. The special indications for the operation have been separately discussed under these subjects.

Statistics and dangers of the operation.

The ordinary statistical tables cannot be depended on as giving any reliable results as to the risks of the operation. Taking all cases together, Dr. Churchill estimates the maternal mortality at 1 in 16, and the infantile as 1 in 3. Like all similar statistics, they are open to the objection of not distinguishing between the results of the operation itself, and of the cause which necessitated interference. Still they are sufficient to show that the operation is not free from grave hazards, and that it must not be undertaken without due reflection. The principal dangers will be discussed as we proceed. It may suffice to mention here that those to the mother must vary with the period at which the operation is undertaken. If version be performed early, before the rupture of the membranes, or, in favourable cases, without the introduction of the hand into the interior of the uterus, the risk must of course be infinitely less than in those more formidable cases in which the waters have long escaped, and the hand and arm have to be passed into an irritable and contracted uterus. But even in the most unfavourable cases accidents may be avoided, if the operator bear constantly in mind that the principal danger consists in laceration of the uterus or vagina from undue force being employed, or from the hand and arm not being introduced in the axis of the passages. There is no operation in which gentleness, absence of all hurry, and complete presence of mind are so essential. A certain number of cases end fatally from shock or exhaustion, or from subsequent complications. As regards the child, the mortality is little, if at all, greater than in original breech and footling presentations. Nor is there any good reason why it should be so, seeing that cases of turning, after the feet are brought through the os, are virtually reduced to those of feet presentation, and that the mere version, if effected

sufficiently soon, is not likely to add materially to the risk to which the child is exposed.

The possibility of effecting *version by external manipulation* has been recognised by various authors, and was made the subject of an excellent thesis by Wigand, who clearly described the manner of performing the operation. In spite of the manifest advantages of the procedure, and the extreme facility with which it can be accomplished in suitable cases, it has by no means become the established custom to trust to it, and probably most practitioners have never attempted it, even under the most favourable conditions. The possibility of the operation is based on the extreme mobility of the fœtus before the membranes are ruptured. After the waters have escaped, the uterine walls embrace the fœtus more or less closely, and version can no longer be readily performed in this manner.

Version by external manipulation.

It may, therefore, be laid down as a rule that it should only be attempted when the abnormal position of the fœtus is detected before labour has commenced, or in the early stage of labour, when the membranes are unruptured. It is also unsuitable for any but transverse presentations, for it is not meant to effect complete evolution of the fœtus, but only to substitute the head for the upper extremity. It is useless whenever rapid delivery is indicated, for, after the head is brought over the brim, the conclusion of the case must be left to the natural powers.

Cases suitable for the operation.

The manner of detecting the presentation by palpation has been already described (vol. i. p. 122), and the success of the operation depends on our being able to ascertain the positions of the head and breech through the uterine walls. Should labour have commenced, and the os be dilated, the transverse presentation may be also made out by vaginal examination. Should the abnormal presentation be detected before labour has actually begun, it is, in most cases, easy enough to alter it, and to bring the fœtus into the longitudinal axis of the uterine cavity. Pinard [1] recommends that after this has been done the fœtus should be maintained in position by a well-fitting elastic abdominal belt. It is seldom, however, discovered until labour has commenced, and even if it be altered, the child is extremely apt to resume, in a short

[1] *De la version par manœuvres externes.* Paris, 1878.

time, the faulty position in which it was formerly lying.
Still there can be no harm in making the attempt, since the
operation itself is in no way painful, and is absolutely with-
out risk either to the mother or child. When the transverse
presentation is detected early in labour, I believe it is good
practice to endeavour to remedy it by external manipulation,
and, if it fail, we may at once proceed to other and more
Method of   certain methods of operating. The procedure itself is abun-
perform-   dantly simple. The patient is placed on her back, and the
ance.   position of the fœtus ascertained by palpation as accurately
as possible, in the manner already described. The palms of
the hands being then placed over the opposite poles of the
fœtus, by a series of gentle gliding movements, the head is
pushed towards the pelvic brim, while the breech is moved
in the opposite direction. The facility with which the fœtus
may sometimes be moved in this way can hardly be appre-
ciated by those who have never attempted the operation.
As soon as the change is effected, the long diameters of the
fœtus and the uterus will correspond, and vaginal examina-
tion will show that the shoulder is no longer presenting, and
that the head is over the pelvic brim. If the os be sufficiently
dilated, and labour in progress, the membranes should now
be punctured, and the position of the fœtus maintained for a
short time by external pressure, until we are certain that the
cephalic presentation is permanently established. If labour
be not in progress, an attempt may at least be made to effect
the same object by pads and a binder; one pad being placed
on the side of the uterus in the situation of the breech, and
another on the opposite side in the situation of the head.

Cephalic   On account of the difficulty of performing *cephalic ver-*
version.   *sion* in the manner usually recommended, it has practically
scarcely been attempted, and with the exception of some
more recent authors, it is generally condemned by writers
on systematic midwifery. Still the operation offers un-
questionable advantages in those transverse presentations in
which rapid delivery is not necessary, and in which the only
object of interference is the rectification of malposition; for,
if successful, the child is spared the risk of being drawn
footling through the pelvis. The objections to cephalic ver-
sion are based entirely on the difficulty of performance; and,
undoubtedly, to introduce the hand within the uterus, search

for, seize, and afterwards place the slippery head in the brim
of the pelvis, could not be an easy process, even under the
most favourable circumstances, and must always be attended
with considerable risk to the mother. Velpeau, who strongly
advocated the operation, was of opinion that it might be
more easily accomplished by pushing up the presenting part,
than by seizing and bringing down the head. Wigand more
distinctly pointed out that the head could be brought to
a proper position by external manipulation, aided by the
fingers of one hand within the vagina. Braxton Hicks has
laid down clear rules for its performance, which render
cephalic version easy to accomplish under favourable con-
ditions, and will doubtless cause it to become a recognised
mode of treating malpositions. The number of cases, how- *Is appli-
ever, in which it can be performed must always be limited, *cable to a
since, as in turning by external manipulation alone, it is *class of
necessary that the liquor amnii should be still retained, or *cases only.
at least have only recently escaped ; that the presentation be
freely movable about the pelvic brim ; and that there be no
necessity for rapid delivery. Dr. Hicks does not believe
protrusion of the arm to be a contra-indication, and advises
that it should be carefully replaced within the uterus.
When, however, protrusion of the arm has occurred, the
thorax is so constantly pushed down into the pelvis that re-
placement can neither be safe nor practicable, except under
unusually favourable conditions, and podalic version will be
necessary.

It is impossible to describe the method of performing *Method of
cephalic version more concisely and clearly* than in Dr. *perform-
Hicks' own words. 'Introduce,' he says, ' the left hand *ance.
into the vagina, as in podalic version ; place the right hand
on the outside of the abdomen, in order to make out the
position of the fœtus, and the direction of its head and feet.
Should the shoulder, for instance, present, then push it with
one or two fingers in the direction of the feet. At the same
time pressure with the other hand should be exerted on the
cephalic end of the child. This will bring the head down to
the os ; then let the head be received on the tips of the
inside fingers. The head will play like a ball between the
two hands; it will be under their command, and can be
placed in almost any part at will. Let the head then be

placed over the os, taking care to rectify any tendency to face presentation. It is as well, if the breech will not rise to the fundus readily, after the head is fairly in the os, to withdraw the hand from the vagina, and with it press up the breech from the exterior. The hand which is retaining gently the head from the outside should continue there for some little time, till the pains have insured the retention of the child in its new position and the adaptation of the uterine walls to its new form. Should the membranes be perfect, it is advisable to rupture them as soon as the head is at the os uteri ; during their flow and after, the head will move easily into its proper position.'

The procedure thus described is so simple, and would occupy so short a time, that there can be no objection to trying it. Should we fail in our endeavours, we shall not be in a worse position for effecting delivery by podalic version, which can be proceeded with without withdrawing the hand from the vagina, or in any way altering the position of the patient.

Podalic version.
The method of performing podalic version varies with the nature of each particular case. In describing the operation, it has been usual to divide the cases into those in which the circumstances are favourable and the necessary manœuvres easily accomplished, and those in which there are likely to be considerable difficulties, and increased risk to the mother. This division is eminently practicable, since nothing can be more variable than the circumstances under which version may be required. Before describing the steps of the operation, it may be well to consider some general conditions applicable to all cases alike.

Position of the patient.
In this country the ordinary position on the left side is usually employed. On the Continent and in America the patient is placed on her back, with the legs supported by assistants, as in lithotomy. The former position is preferable not only as a matter of custom, and as involving much less fuss and exposure of the person, but because it admits of both the operator's hands being more easily used in concert. In certain difficult cases, when the liquor amnii has escaped, and the back of the child is turned towards the spine of the mother, the dorsal decubitus presents some advantages in enabling the hand to pass more readily over the body of the

child ; but such cases are comparatively rare. The patient
should be brought to the side of the bed, across which she
should be laid, with the hips projecting over, and parallel to
the edge, the knees being flexed towards the abdomen, and
separated from each other by a pillow, or by an assistant.
Assistants should also be placed so as to restrain the patient
if necessary, and prevent her involuntarily starting from the
operator, as this might not only embarrass his movements,
but be the cause of serious injury.

The exhibition of anæsthetics is peculiarly advantageous. Adminis-
There is nothing which tends to facilitate the steps of the tration of
process so much as stillness on the part of the patient, and tics.
anæsthe-
the absence of strong uterine contraction. When the vagina
is very irritable and the uterus firmly contracted round the
body of the child, complete anæsthesia may enable us to
effect version, when without it we should certainly fail.

The most favourable time for operating is when the os Period
is fully dilated, before, or immediately after, the rupture of when the
operation
the membranes and the discharge of the liquor amnii. The should be
advantage gained by operating before the waters have escaped under-
taken.
cannot be overstated, since we can then make the child rotate
with great facility in the fluid medium in which it floats. In
the ordinary operation, in which the hand is passed into the
uterus, it is essential to wait until the os is of sufficient size
to admit of its being introduced with safety. This may
generally be done when the os is the size of a crown-piece,
especially if it be soft and yielding.

The practice followed with regard to the hand to be used Choice of
in turning varies considerably. Some accoucheurs always be used.
hand to
employ the right hand, others the left, and some one or
other, according to the position of the child. In favour of
the right hand, it is said that most practitioners have more
power with it, and are able to use it with greater gentleness
and delicacy. In transverse presentations, if the abdomen of
the child be placed anteriorly, the right hand is said to be
the proper one to use, on account of the greater facility with
which it can be passed over the front of the child ; and in
difficult cases of this kind, when we are operating with the
patient on her back, it certainly can be employed with more
precision than the left. In all ordinary cases, however, the
left hand can be introduced much more easily in the axis of

the passages, the back of the hand adapts itself readily to the curve of the sacrum, and, even when the child's abdomen lies anteriorly, it can be passed forwards without difficulty so as to seize the feet. These advantages are sufficient to recommend its use, and very little practice is required to enable the practitioner to manipulate with it as freely as with the right. If, in addition, we remember that the right hand is required to operate on the fœtus through the abdominal

Fig. 148.
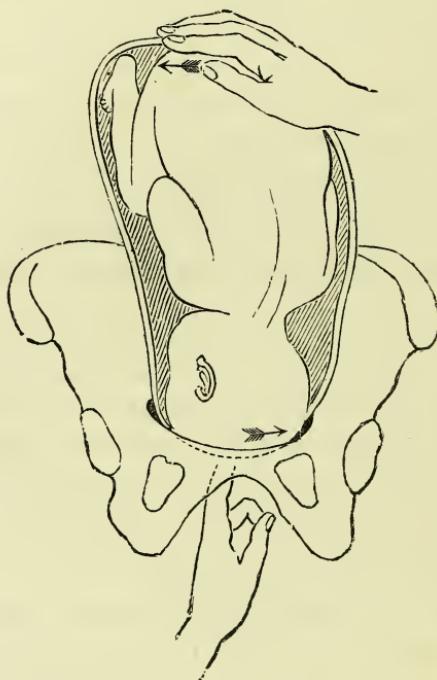
FIRST STAGE OF BI-POLAR VERSION.
ELEVATION OF THE HEAD AND DEPRESSION OF THE BREECH. (After Barnes.)

walls—and this is a point which should never be forgotten— we shall have abundant reasons for laying it down as a rule that the left hand should generally be employed. Before passing the hand and arm they should be freely lubricated, with the exception of the palm, which is left untouched to admit of a firm grasp being taken of the fœtal limbs. It is also advisable to remove the coat, and bare the arm as high as the elbow.

As it should be a cardinal rule to resort to the simplest

procedure when practicable, it will be well to consider first
the method by combined external and internal manipulation,
without passing the hand into the uterus, and subsequently
that which involves the introduction of the hand.

To effect podalic version by the combined method it is an
essential preliminary to ascertain the situation of the fœtus
as accurately as possible. It will generally be easy, in trans-
verse presentation, to make out the breech and head by
palpation; while, in head presentations, the fontanelles will
show to which side of the pelvis the face is turned. The left

Turning
by com-
bined ex-
ternal and
internal
manipula-
tion.

Fig. 149.
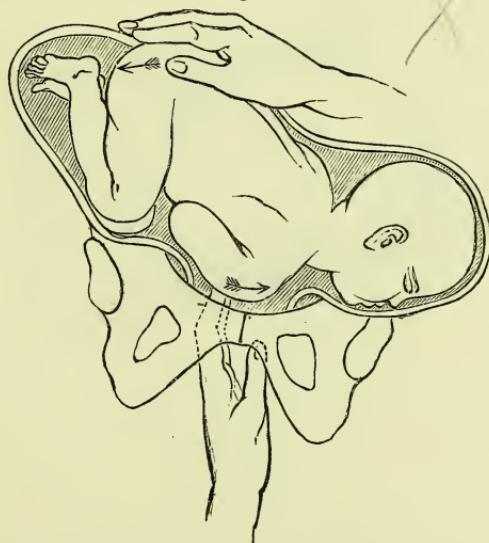
SECOND STAGE OF BI-POLAR VERSION.
ELEVATION OF THE SHOULDERS AND DEPRESSION OF THE BREECH. (After Barnes.)

hand is then to be passed carefully into the vagina, in the axis
of the canal, to a sufficient extent to admit of the fingers
passing freely into the cervix. To effect this, it is not always
necessary to insert the whole hand, three or four fingers
being generally sufficient.

If the head lie in the first or fourth position, push it
upwards and to the left; while the other hand, placed ex-
ternally on the abdomen, depresses the breech towards the
right (fig. 148). By this means we act simultaneously on
both extremities of the child's body, and easily alter its
position. The breech is pushed down gently but firmly, by
gliding the hand over the abdominal wall. The head will now

pass out of reach, and the shoulders will arrive at the os, and will lie on the tips of the fingers. This is similarly pushed upwards in the same direction as the head (fig. 149), the breech at the same time being still further depressed, until the knee comes within reach of the fingers, when (the membranes being now ruptured, if still unbroken) it is seized and pulled down through the os (fig. 150). Occasionally the foot comes immediately over the os, when it can be seized instead of the knee. Version may be facilitated by changing the position of the external hand, and pushing the head upwards from the iliac fossa, instead of continuing the attempt to

Fig. 150.
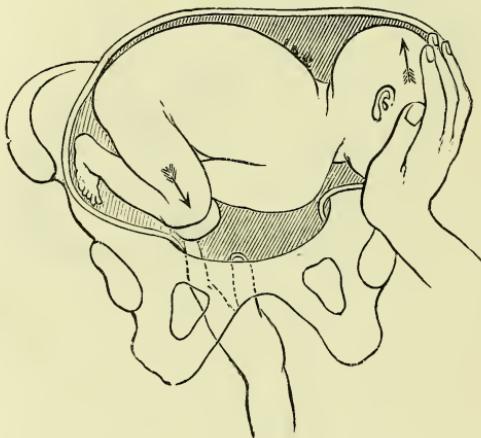
THIRD STAGE OF BI-POLAR VERSION.
SEIZURE OF THE KNEE AND PARTIAL ELEVATION OF THE HEAD. (After Barnes.)

depress the breech (figs. 150 and 151). These manipulations should always be carried on in the intervals, and desisted from when the pains come on; and when the pains recur with great force and frequency, the advantage of chloroform will be particularly apparent. In the second and third positions, the steps of the operation should be reversed: the head is pushed upwards and to the right, the breech downwards and to the left. When the position cannot be made out with certainty, it is well to assume that it is the first, since that is the one most frequently met with; and even if it be not, no great inconvenience is likely to occur. If the os be not sufficiently open to admit of delivery being concluded, the lower extremity can be retained in its new position

with one finger, until dilatation is sufficiently advanced,
or until the uterus has permanently adapted itself to the
altered position of the child, either of which results will
generally be effected in a short space of time.

In transverse presentations the same means are to be
adopted, the shoulder being pushed upwards in the direction
of the head, while the breech is depressed from without.
This is frequently sufficient to bring the knees within reach,
especially if the membranes are entire, but version is much

Fig. 151.

FOURTH STAGE OF BI-POLAR VERSION.
DRAWING DOWN OF THE LEGS AND COMPLETION OF VERSION. (After Barnes.)

facilitated by pressing the head upwards from without,
alternately with depression of the breech.   If the liquor
amnii has escaped, and the uterus is firmly contracted round
the body of the child, it will be found impossible to effect
an alteration in its position without the introduction of the
hand, and the ordinary method of turning must be employed.
The peculiar advantage of the combined process is, that it in
no way interferes with the latter, for, should it not succeed,
the hand can be passed on into the uterus without with-
drawal from the vagina (provided the os be sufficiently
dilated), and the feet or knees seized and brought down.

Turning, with the hand introduced into the uterus, pro-vided the waters have not or have only recently escaped, and the os be sufficiently dilated, is an operation generally performed with ease.

The first step, and one of the most important, is the introduction of the hand and arm. The fingers having been pressed together in the form of a cone, the thumb lying between the rest of the fingers, the hand, thus reduced to the smallest possible dimensions, is slowly and carefully passed into the vagina, in the axis of the outlet, in an interval between the pains, and passed onwards in the same cautious manner, and with a semi-rotatory motion, until it lies entirely within the vagina, the direction of introduction being gradually changed from the axis of the outlet to that of the brim. If uterine contractions come on, the hand should remain passive until they are over. It should ever be borne in mind, as one of the fundamental rules in per-forming version, that we should act only in the absence of pains, and then with the utmost gentleness—all force and violent pushing being avoided. The hand, still in the form of a cone, having arrived at the os, if this be sufficiently dilated, may be passed through at once. If the os be not quite open, but dilatable, the points of the fingers may be gently insinuated, and occasionally expanded, so as to press it open sufficiently to permit the rest of the hand to pass. While this is being done, the uterus should be steadied by the other hand placed externally, or by an assistant. If the presentation should not previously have been made out with accuracy, we can now ascertain how to pass the hand onwards, so that its palmar surface may correspond with the abdomen of the child.

The membranes should now be ruptured—if possible during the absence of pain—so as to prevent the waters being forced out. The hand and arm form a most efficient plug, and the liquor amnii cannot escape in any quantity. Some practitioners recommend that, before rupturing the mem-branes, the hand should be passed onwards between them and the uterine walls, until we reach the feet. By so doing we run the risk of separating the placenta ; besides, we have to introduce the hand much farther than may be necessary, since the knees are often found lying quite close to the os.

As soon as the membranes are perforated, the hand can be passed on in search of the feet (fig. 152). At this stage of the operation increased care is necessary to avoid anything like force ; and should a pain come on, the hand must be kept perfectly flat and still, and rather pressed on the body of the child than on the uterus. If the pains be strong, much inconvenience may be felt from the compression ; and, were the onward movement continued, or the hand even kept

Fig. 152.
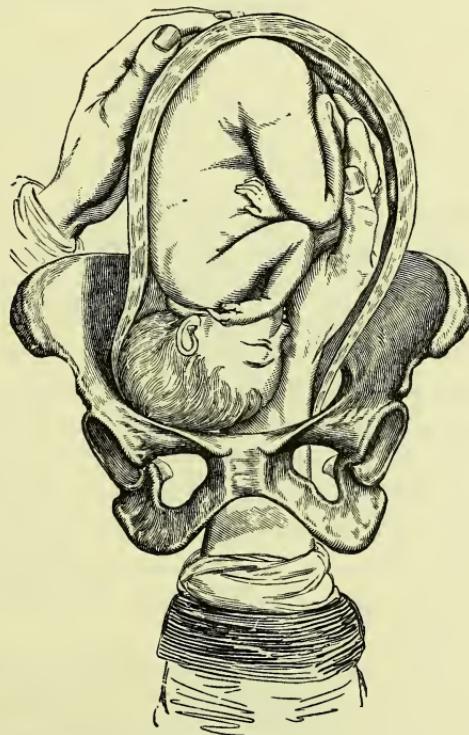
SEIZURE OF THE FEET WHEN THE HAND IS INTRODUCED INTO THE UTERUS.

bent in the conical form in which it was introduced, rupture of the uterine walls might easily be caused. This is not likely to occur in the class of cases now under consideration, for it is chiefly when the waters have long escaped that the progress of the hand is a matter of difficulty. Valuable assistance may now be given by pressing the breech downwards from without, so as to bring the knees or feet more easily within the reach of the internal hand. Having arrived at the knees or feet, they may be seized between the fingers,

lower extremity is brought through the os, the case is con- the case
verted into a foot or knee presentation, and it comes to be after
version.
a question whether delivery should now be left to nature or
terminated by art.   This must depend to a certain extent on
the case itself, and on the cause which necessitated version,
but, generally, it will be advisable to finish delivery without
unnecessary delay.   To accomplish this, downward traction
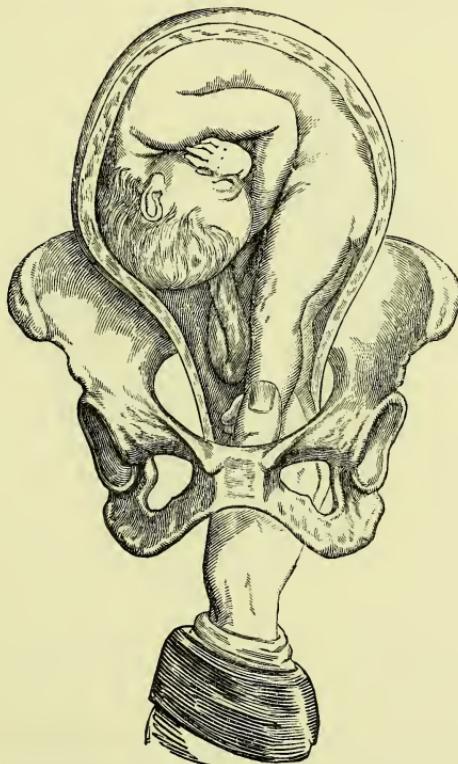
Fig. 153.

DRAWING DOWN OF THE FEET AND COMPLETION OF VERSION.

is made during the pains, and desisted from in the intervals
(fig. 154).   As the umbilical cord appears, a loop should be
drawn down; and if the hands be above the head, they must
be disengaged and brought over the face, in the same manner
as in an ordinary footling presentation.   The management of
the head, after it descends into the cavity of the pelvis, must
also be conducted as in labours of that description.

In cases of placenta prævia the os will, as a rule, be more Turning in
easily dilatable than in transverse presentations.   Hicks's placenta
prævia.

method offers the great advantage of enabling us to perform version much sooner than was formerly possible, since it only requires the introduction of one or two fingers into the os uteri. Should we not succeed by it, and the state of the patient indicates that delivery is necessary, we have at our command, in the fluid dilators, a means of artificially dilating the os uteri which can be employed with ease and safety. If we have to do with a case of entire placental presentation,

Fig. 154.
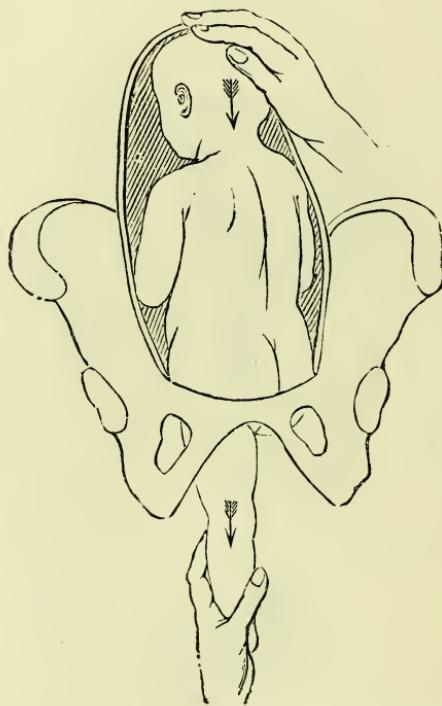
SHOWING THE COMPLETION OF VERSION. (After Barnes.)

the hand should be passed at that point where the placenta seems to be least attached. This will always be better than attempting to perforate its substance, a measure sometimes recommended, but more easily performed in theory than in practice. If the placenta only partially present, the hand should, of course, be inserted at its free border. It will frequently be advisable not to hasten delivery after the feet have been brought through the os, for they form of themselves a very efficient plug, and effectually prevent further

loss of blood; while, if the patient be much exhausted, she may have her strength recruited by stimulants, &c., before the completion of delivery.

In abdomino-anterior positions, in which the waters have escaped, and in which, therefore, some difficulty may be reasonably anticipated, the operation is generally more easily performed with the patient on her back: the right hand is then introduced into the uterus, and the left employed externally (fig. 155). In this way the internal hand has to

Turning in abdomino-anterior positions.

Fig. 155.
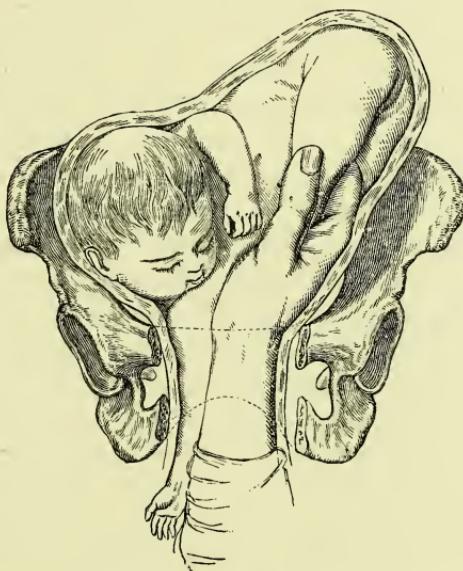
SHOWING THE USE OF THE RIGHT HAND IN ABDOMINO-ANTERIOR POSITION.

be passed a shorter distance, and in a less constrained position. The operator then sits in front of the patient, who is supported at the edge of the bed in the lithotomy position with the thighs separated, and the right hand is passed up behind the pubes, and over the abdomen of the child.

The difficulties of turning culminate in those unfavourable cases of arm presentation in which the membranes have been long ruptured, the shoulder and arm pressed down into the pelvis, and the uterus contracted round the body of the child. The uterus being firmly and spasmodically contracted, the attempt to introduce the hand often only makes matters worse, by inducing more frequent and stronger pains. Even

Difficult cases of arm presentation.

if the hand and arm be successfully passed, much difficulty is often experienced in causing the body of the child to rotate; for we have no longer the fluid medium present in which it floated and moved with ease, and the arm of the operator may be so cramped and pained, by the pressure of the uterine walls, as to be rendered almost powerless. The risk of laceration is also greatly increased, and the care necessary to avoid so serious an accident adds much to the difficulty of the operation.

Value of anæsthesia in relaxing the uterus.

In these perplexing cases various expedients have been tried to cause relaxation of the spasmodically contracted uterine fibres, such as copious venesection in the erect attitude until fainting is induced, warm baths, tartar emetic and similar depressing agents. None of these, however, are so useful as the free administration of chloroform, which has practically superseded them all, and often answers most effectually when given to its full surgical extent.

Mode of procedure.

The hand must be introduced with the precautions already described. If the arm be completely protruded into the vagina, we should pass the hand along it as a guide, and its palmar surface will at once indicate the position of the child's abdomen. No advantage is gained by amputation, as 'is sometimes recommended. When the os is reached, the real difficulties of the operation commence, and, if the shoulder be firmly pressed down into the brim of the pelvis, it may not be easy to insinuate the hand past it. It is allowable to repress the presenting part a little, but with extreme caution, for fear of injuring the contracted uterine parietes. It is better to insinuate the hand past the obstruction, which can generally be done by patient and cautious endeavours. Having succeeded in passing the shoulder, the hand is to be pressed forward in the intervals, being kept perfectly flat and still on the body of the fœtus when the pains come on. It is much safer to press on it than on the uterine walls, which might readily be lacerated by the projecting knuckles. When the hand has advanced sufficiently far, it will be better, for the reasons already mentioned, to seize and bring down one knee only.

Management of cases in which the

Even when the foot has been seized and brought through the os, it is by no means always easy to make the child revolve on its axis, as the shoulder is often so firmly fixed in

the pelvic brim as not to rise towards the fundus.   Some foot is brought down but the fœtus will not revolve.
assistance may be derived from pushing the head upwards
from without, which, of course, would raise the shoulder
along with it.   If this should fail, we may effect our object
by passing a noose of tape or wire ribbon round the limb, by
which traction is made downwards and backwards ; at the
same time, the other hand is passed into the vagina, to
displace the shoulder and push it out of the brim.   It is
evident that this cannot be done as long as the limb is
held by the left hand, as there is no room for both hands to
pass into the vagina at the same time.   By this manœuvre
version may be often completed, when the fœtus cannot be
turned in the ordinary way.   Various instruments have been
invented, both for passing a lac round the child's limb, and
for repressing the shoulder, but none of them can compete,
either in facility of use or safety, with the hand of the
accoucheur.

Should all attempts at version fail, no resource is left but If all attempts at version fail, mutilation of the fœtus is necessary.
the mutilation of the child, either by evisceration or decapi-
tation.   This extreme measure is, fortunately, seldom neces-
sary, as with due care version may generally be effected, even
under the most unfavourable circumstances.

CHAPTER III.

THE FORCEPS.

Of all obstetric operations the most important, because the most truly conservative both to the mother and child, is the application of the forceps. In modern midwifery the use of the instrument is much extended, and it is now applied by some of our most experienced accoucheurs with a frequency which older practitioners would have strongly reprobated. That the injudicious and unskilful use of the forceps is capable of doing much harm, no one will for a moment deny. This, however, is not a reason for rejecting the recommendation of those who advise a more frequent resort to the operation, but rather for urging on the practitioner the necessity of carefully studying the manner of performing it, and of making himself familiar with the cases in which it is easy or the reverse. Nothing but practice—at first on the dummy, and afterwards in actual cases—can impart the operative dexterity which it should be the aim of every obstetrician to acquire, and without which there can be no assurance of his doing his duty to his patient efficiently.

Frequent use of the forceps in modern practice.

The forceps may best be described as a pair of artificial hands by which the fœtal head may be grasped and drawn through the maternal passages by a *vis à fronte*, when the *vis à tergo* is deficient. This description will impress on the mind the important action of the instrument as a tractor, to which all its other powers are subservient. The forceps consists of two separate blades of a curved form, adapted to fit the child's head; a lock by which the blades are united after introduction; and handles which are grasped by the operator, and by means of which traction is made. It would be a wearisome and unsatisfactory task to dwell on all the modifications of the instrument which have been made, which

Description of the instrument.

are so numerous as to make it almost appear as if no one could practise midwifery with the least pretension to eminence, unless he has attached his name to a new variety of forceps.

The original instrument, invented by the Chamberlens, The short forceps. may be looked upon as the type of the short straight forceps, which has been more employed than any other, and which, perhaps, finds its best representative in the short forceps of
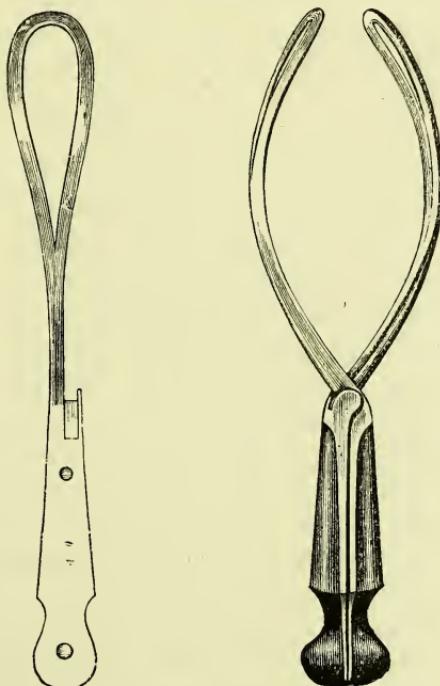
Fig. 156.

DENMAN'S SHORT FORCEPS.

Denman (fig. 156). Indeed the only essential difference between the two is the lock of the latter, originally invented by Smellie, which is so excellent that it has been adopted in all British forceps; and which, for facility of juncture, is much superior to either the French pivot or the German lock, while for firmness it is, for all practical purposes, as good as either. In this instrument the blades are 7, the Denman's forceps. handle $4\frac{3}{8}$, inches in length; the extremities of the blades are exactly 1 inch apart, and the space between them, at their widest part, is $2\frac{7}{8}$ inches. The blades measure $1\frac{3}{4}$

inches at their greatest breadth, and spring with a regular sweep, directly from the lock, there being no shank. The blades are formed of the best and most highly tempered steel, to resist the strain to which they are occasionally subjected, and they are smooth and rounded on their inner surface, to obviate the risk of injury to the scalp of the child.

The special advantage claimed for this form of instrument is that, the two halves being precisely similar, no care or forethought is required on the part of the practitioner as to which blade should be introduced uppermost—an advantage of no great value, since no one should undertake a case of forceps delivery who has not sufficient knowledge of the operation, and presence of mind enough to obviate any risk from the introduction of the wrong blade first. On account of its shortness, and the want of the second or pelvic curve, it is only adapted for cases in which the head is low down in the pelvis, or actually resting on the perinæum.

The question of the second or pelvic curve is one on which there is much difference of opinion. The forceps we are now considering, and the many modifications formed on the same plan, is constructed solely with reference to its grasp on the child's head, and without regard to the axes of the maternal passages. Consequently, were we to introduce it when the head was at the upper part of the pelvis, we could not fail to expose the soft parts to the risk of contusion, and (in consequence of the necessity of drawing more directly backwards) unduly stretch and even lacerate the perinæum. Hence it is now admitted by obstetricians, with few exceptions, that the second curve is essential before the complete descent of the head, although it is not absolutely so after this has taken place. The only circumstances under which a straight blade can possess any superiority are in certain cases of occipito-posterior position, in which it is found necessary to rotate the head round a large extent of the pelvis, when the circular sweep of a strongly curved instrument might prove injurious. Such cases, however, are of rare occurrence, and need in no way influence the general employment of the pelvic curve.

The short forceps usually employed in Scotland is the invention of the late Dr. Zeigler (fig. 157), and is useful from the facility with which the blades may be introduced in

accurate apposition to each other, a point which in practice
is of no little value. In general size and appearance it
closely resembles Denman's forceps, but the fenestra of the
lower blade is continued down to the handle. In intro-
ducing, the lower blade is slipped over the handle of the other
blade already *in situ*, and thus it is guided
with great certainty into a proper position,
locking itself as it passes on. This instru-
ment has the disadvantage of not having
the second curve, but the facility of intro-
duction has rendered it a great favourite
with many who have been in the habit of
employing it.

Fig. 157.

ZEIGLER'S FORCEPS.

For cases in which the head is not on
the perinæum, or at least not quite low in
the pelvis, a longer instrument is essential.
To meet this indication Smellie invented
the long forceps, which, like the shorter
instrument, has been very variously modified.
The most perfect instrument of the kind
employed in this country is that known as
Simpson's forceps (fig. 158), which combines many excellent
points selected from the forceps of various obstetricians, as well
as some original additions, and which, as a whole, has never
been surpassed, until Tarnier's, or its modification, was in-
vented. The curved portions of the blades are $6\frac{1}{4}$ inches
long, the fenestra measuring $1\frac{1}{4}$ at its widest part. The
extremities of the blades are 1 inch asunder when the
handles are closed, and 3 inches at their widest part. The
object of this somewhat unusual width is to lessen the com-
pressing power of the instrument, without in any way inter-
fering with its action as a tractor. The pelvic curve is less
than in most long forceps, so as to admit of the rotation of
the head when necessary, without the risk of injuring the
maternal structure. Between the curve of the blade and
the lock is a straight portion or shank, measuring $2\frac{3}{8}$ inches,
which, before joining the handle, is bent at right angles into
a knee. This shank is a useful addition to all forceps, and is
essential in the long forceps to insure the junction of the
blades beyond the parts of the mother, which might other-
wise be caught in the lock and injured. The knees serve
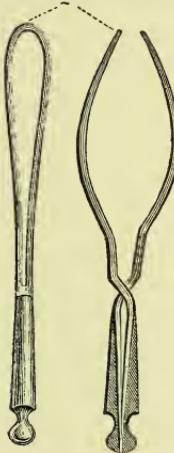
The long
forceps.

Simpson's
forceps.

the purpose of preventing the blades from slipping from each other after they have been united. They also admit of one finger being introduced above the lock, and used as an aid in traction ; a provision which is made in some other varieties of long forceps by a semicircular bend in each shank. The handles, which in most British forceps are too small and smooth to afford a firm grasp, are serrated at the edge, and

Fig. 158.
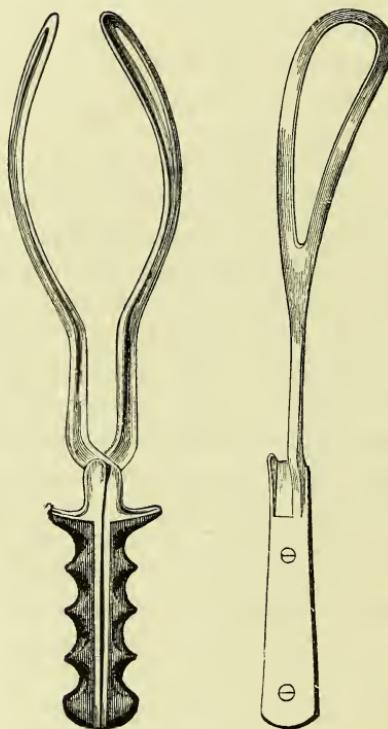
SIMPSON'S FORCEPS.

flattened from before backwards, so as to fit the closed fist more accurately. At their extremities, near the lock, there are a pair of projecting rests, over which the fore and middle fingers may be passed in traction, and which greatly increase our power over the instrument. Although this and other varieties of the long forceps are specially constructed for application when the head is high in the pelvis, it answers quite as well as the short forceps—indeed, in most respects better—when the head has descended low down. It is a

Long forceps are suitable to all cases of forceps delivery.

decided advantage for the practitioner to habituate himself
to the use of one instrument, with the application and power
of which he becomes thoroughly familiar. It is a mere waste
of space and money for him to encumber himself with a
number of instruments of various shapes and sizes, and he
may be sure that a good pair of long forceps will be suitable
for every emergency, and in any position of the head.

The chief argument against the use of such an instru-
ment in simple cases is its great power. This, however, is
entirely based on a misconception. The existence of power
does not involve its use, and the stronger instrument can be
employed with quite as much delicacy and gentleness as the
weaker. The remarks of Dr. Hodge [1] on this point are ex-
tremely apposite, and are well worthy of quotation. He says :
' Certainly no man ought to apply the forceps who has not
sufficient discretion to use no more force than is absolutely
requisite for safe delivery. If, therefore, there is more power
at command, he is not obliged to use it ; while on the con-
trary, if much power be demanded, he can, within the bounds
of prudence, exercise it by the long forceps, but with the
short forceps his efforts might be unavailing. Moreover, in
cases of difficulty, the short forceps being used, the prac-
titioner would be forced to make great muscular efforts ;
while with the long forceps, owing to the great leverage, such
effort will be comparatively trifling, and, of course, the whole
force demanded can be much more delicately, and at the
same time efficiently, applied, and with more safety to the
tissues of the child and its parent.'

The forceps usually employed on the Continent and in
America differs considerably, both in appearance and con-
struction, from those in use in this country. As a rule it is
a larger and more powerful instrument, joined by a pivot or
button joint, and it always possesses the second or pelvic
curve. Of late years Simpson's forceps has been much em-
ployed in some parts of Germany. The chief objection to
the Continental instruments is their cumbrousness. This
is chiefly in the handles, which in many of them are forged
in a piece with the blades, the part introduced within the
maternal structures not being materially different from the
corresponding part of the English instrument.

*Disad-
vantages
of a weak
instru-
ment.*

*Conti-
nental
forceps.*

[1] *System of Obstetrics*, p. 242.

The forceps invented by Professor Tarnier (fig. 159) has recently attracted considerable attention.   In this instrument traction is not made on the handles by which the blades are

Fig. 159.
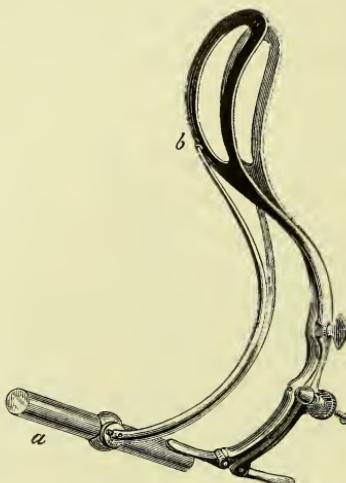
TARNIER'S FORCEPS.

introduced, as in ordinary forceps, but on a supplementary handle (*a*) subsequently attached to the blades near the lower opening of their fenestræ (*b*).   The object claimed for this arrangement is that less force is required in traction, which can always be made in the proper axis of the pelvis ; that the blades are not likely to slip ; and that rotation of the head is not interfered with.   The handles of the forceps, moreover, guide the operator to the direction in which he ought to pull, since all that is required is to keep the traction rods parallel to them.   This instrument, however, although theoretically perfect, is somewhat too complicated for general use.

Professor Simpson, of Edinburgh, has invented a modification of Tarnier's instrument, which he calls the ' Axis Traction Forceps' (fig. 160).   The supplementary handles are fixed to the blades, and the whole mechanism is much simpler than in Tarnier's forceps.   Dr. Simpson reports very favourably of this forceps, and it is certainly well adapted for the object aimed at.   For some years I have used it extensively, and have every reason to be satisfied with it, especially in

the high forceps operation, in which it seems to me superior
to any other instrument.

The forceps is generally said to act in three different Action of
the instru-
ment.
ways :—

    1st. *As a tractor.*

    2nd. *As a lever.*

    3rd. *As a compressor.*

It is more especially as a tractor that the instrument is The chief
use of the
forceps
is as a
tractor.
of value, and it is used with the greatest advantage when it
is employed merely to supplement the action of the uterus,
which is insufficient of itself to effect delivery, or when, from

Fig. 160.
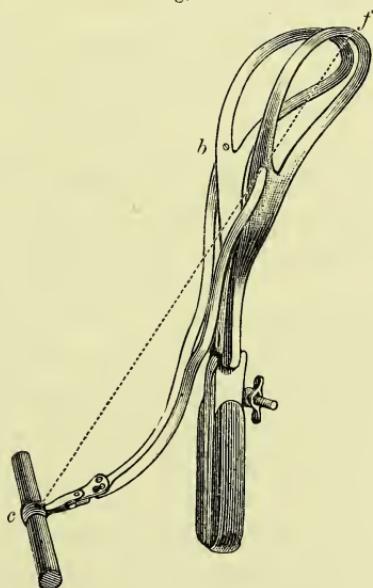
SIMPSON'S AXIS TRACTION FORCEPS.
c, b. Traction handle. *c, f.* Line of traction.

some complication, it is necessary to complete labour with
greater rapidity than can be accomplished by the unaided
powers of nature.   In most cases traction alone is sufficient;
but, in order that it may act satisfactorily, and that the
instrument may not slip, a proper construction of the for-
ceps, and a sufficient curvature of the blades, are essential.
The want of these is the radical fault of many of the short,
straight instruments in common use, which have a tendency
to slip during our efforts at extraction.

The forceps acts also as a lever, but this action has been greatly exaggerated. It is generally described as a lever of the first class, the power being at the handles, the fulcrum at the lock, and the weight at the extremities. There may possibly be some leverage power of this kind when the instrument is first introduced, and the handles held so loosely that one blade is able to work on the other. But, as ordinarily used, the handles are held with a sufficiently firm grasp to prevent this movement, and then the two blades practically form a single instrument.

Galabin, who has studied this subject in detail, points out[1] that: ' 1. The lever is formed by both blades of the forceps and the fœtal head united in one immovable mass. As soon as the blades begin to slip over the head, the lever is decomposed, and the swaying movement ceases to have any mechanical advantage. 2. The power is applied to the handles in a slanting direction. The resistance or weight does not act at a point either between the former and the fulcrum, or beyond the fulcrum, but at a point in a plane nearly at right angles to the line joining these two points, and its direction is a line perpendicular to that plane of the pelvis in which the greatest section of the head is engaged; that is to say, in the case of straight forceps, nearly parallel to the handles. The lever formed does not, therefore, strictly speaking, belong to any one of the three orders into which levers are commonly divided. 3. The fulcrum is fixed partly by friction, partly by the combination of traction with oscillatory movements—in other words, by the power being directed in great measure downwards, and only slightly to one side.'

He further shows that the pendulum motion of the forceps is superfluous in all ordinary forceps operations, in which traction alone is amply sufficient for delivery ; but that when the head is impacted, and great force is required for its extraction, a mechanical advantage may be gained from having recourse to an oscillatory movement, which should, however, be very limited, and only continued if found to effect distinct advance of the head.

Regarding the compressive power of the instrument there has been much difference of opinion. There is no doubt

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[1] Galabin, ' Action of Midwifery Forceps as a Lever,' *Obstetrical Journal*, November 1876.

that the forceps, especially some of the foreign instruments
in which the points nearly approach each other, is capable of
exerting considerable compression on the head.   It is, how-
ever, extremely problematical if this action be of real value.
It is to be borne in mind that in cases of protracted labour
the head has been already moulded and compressed, and the
bones have been made to overlap each other to their utmost
extent, by the sides of the pelvis.   We can scarcely, there-
fore, expect to diminish the head much more by the forceps
without employing an amount of force that will seriously
endanger the life of the child.   It is in cases of disproportion
between the head and the pelvis, depending on slight antero-
posterior contraction of the pelvic brim, that diminution of
the child's head by compression would be most useful.   Then,
however, the pressure of the forceps is exerted on that por-
tion of the head which lies in the most roomy diameter of
the pelvis, where there is no want of space.   If this pressure
do not increase the opposite diameter, which is in apposition
to the narrower portion of the pelvis, it can at least do
nothing towards lessening it, and diminution of any other
part of the child's head is not required.

The mere introduction of the forceps sometimes excites
increased uterine action, through the reflex irritation induced
by the presence of a foreign body in the vagina.   This has
been called the dynamical action of the forceps ; but it can-
not be looked upon in any other light than that of an occa-
sional accidental result. *Dynami-
cal action
of the
forceps.*

The circumstances indicating the use of the forceps have
been separately considered elsewhere, and to recapitulate
them here would only lead to needless repetition.   I shall,
therefore, now merely describe the mode of using the
instrument. *Cases re-
quiring
the use of
the for-
ceps are
considered
elsewhere.*

Before doing so it is well to repeat what has already been
said as to the difference between what may be termed the
high and low forceps operations.   The application of the
instrument, when the head is low in the pelvis, is extremely
simple ; and when there is no disproportion between the
head and the pelvis, and some slight traction is alone re-
quired to supplement deficient expulsive power, the operation,
in the hands of any ordinary well-instructed practitioner,
ought to be perfectly safe both to the mother and child.   It *Difference
between
the high
and low
opera-
tions.*

is very different when the head is arrested at the brim, or high in the pelvis. Then the application of the forceps is an operation requiring much dexterity for its proper performance, and must never be undertaken without anxious consideration. It is because these two classes of operations have been confused that the use of the instrument is regarded by many with such unreasonable dread.

Preliminary considerations. Before attempting to introduce the forceps, there are several points to which attention should be directed.

1st. The membranes must, of course, be ruptured.

2ndly. For the safe and easy application of the instrument, it is also advisable that the os should be fully dilated, and the cervix retracted over the head. Still, these two points cannot be regarded, as many have laid down, as being *sine quâ non*. Indeed, we are often compelled to use the instrument when, although the os is fully dilated, the rim of the cervix can be felt at some point of the contour of the head, especially in cases in which the anterior lip is jammed between the head and the pubes. Provided due care be taken to guard the cervical rim with the fingers of one hand, as the instrument is slipped past it, there need be no fear of injury from this cause. If the os be not fully dilated, but is sufficiently open to admit of the passage of the forceps, the operation, under urgent circumstances, may be quite justifiable, but it must necessarily be a somewhat anxious one.

3rdly. The position of the head should be accurately ascertained by means of the sutures and fontanelles. Unless this be done, the operation will always be haphazard and unsatisfactory, as the practitioner can never be in possession of accurate knowledge of the progress of the case. It may be that the occiput is directed backwards; and, although that does not contra-indicate the application of the forceps, it involves special precautions being taken.

4thly. The bladder and bowels should be emptied.

Question of administering anæsthetics. Before proceeding to operate, the question of anæsthesia will arise. In any case likely to be difficult it is of the greatest assistance to have the patient completely under the influence of an anæsthetic to the surgical degree, so as to have her as still as possible; but, whenever this is deemed necessary, another practitioner should undertake the responsibility of the administration. In simple cases I believe it is better

to dispense with anæsthetics altogether, partly because they are apt to stop what pains there are, which is in itself a disadvantage, but chiefly because, under partial anæsthesia, the patient loses her self-control, is restless, and twists herself into awkward positions, which give rise to the utmost difficulty and inconvenience in the use of the instrument. Moreover, if no anæsthetic be given, the patient can assist the operator by placing herself in the most convenient attitude.

In describing the method of applying the forceps, I shall assume that we have to do with the simpler variety of the operation, when the head is low in the pelvis. Subsequently I shall point out the peculiarities of the high operation.

<div style="text-align:right">Description of the operation.</div>

As to the position of the patient, I believe there can be no doubt of the superiority of that which is usually adopted in this country. On the Continent and in America the forceps is always employed with the patient lying on her back, a position involving much needless exposure of the person, and requiring more assistance from others. In certain cases of unusual difficulty the position on the back is of unquestionable utility, but we may, at least, commence the operation in the usual way, and subsequently turn the patient on her back if desirable.

<div style="text-align:right">Position of the patient.</div>

Much of the facility with which the blades are introduced depends on the patient's being properly placed. Hence, although it gives rise to a little more trouble at first, I believe that it is always best to pay particular attention to this point, whether the high or low forceps operation be about to be performed. The patient should be brought quite to the side of the bed, with her nates parallel to and projecting somewhat over its edge. The body should lie almost directly across the bed, and nearly at right angles to the hips, with the knees raised towards the abdomen (fig. 161). In this way there is no risk of the handle of the upper blade, when depressed in introduction, coming in contact with the bed.

<div style="text-align:right">Importance of suitable position.</div>

The blades should be warmed in tepid water, lubricated with cold cream or carbolic oil, and placed ready to hand.

These preliminaries having been attended to, we proceed to the introduction of the blades, sitting by the side of the bed, opposite the nates of the patient.

The important question now arises, in what direction are the blades to be passed? The almost universal rule in our standard works is, that they must be passed as nearly as possible over the child's ears, without any reference to the pelvic diameters. Hence, if the head have not made its turn, but is lying in one oblique diameter, the blades would require to be passed in the opposite oblique diameter; in short, the position of the forceps, as regards the pelvis, must vary according to the position of the head. Some have even laid down the rule that the forceps is contra-indicated unless

Fig. 161.
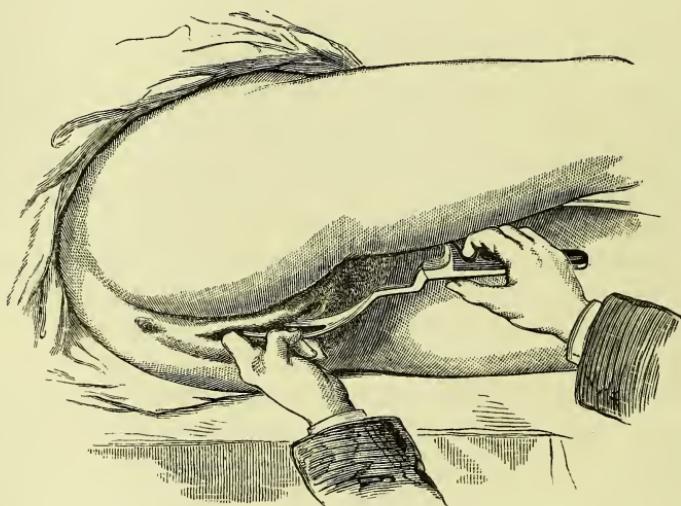
POSITION OF PATIENT FOR FORCEPS DELIVERY AND MODE OF INTRODUCING LOWER BLADE

an ear can be felt; a rule that would very seriously limit its application, as in many cases in which it is urgently required it is a matter of great difficulty, and even impossibility, to feel the ear at all. It is admitted that in the high forceps operation the blades must be introduced in the transverse diameter of the pelvis, without relation to the position of the head. On the Continent it is generally recommended that this rule should be applied to all cases of forceps delivery alike, whether the head be high or low, and I have now for many years adopted this plan, and passed the blades in all cases, whatever be the position of the head, in the transverse diameter of the pelvis, without any attempt to pass them

over the bi-parietal diameter of the child's head.   Dr. Barnes them in
points out with great force that, do what we will, and attempt
as we may, to pass the blades in relation to the child's head,
they find their way to the sides of the pelvis, and that the
marks of the fenestræ on the head always show that it has
been grasped by the brow and side of the occiput.   Of the
perfect correctness of this observation I have no doubt ;
hence it is a needless element of complexity to endeavour to
vary the position of the blades in each case, and one which
only confuses the inexperienced practitioner, and renders more

relation to the sides of the pelvis.

Fig. 162.
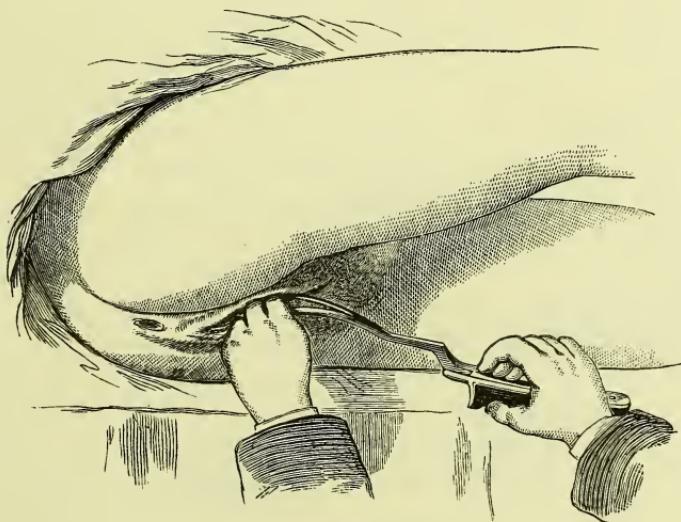
INTRODUCTION OF THE UPPER BLADE.

difficult an operation which should be simplified as much as
possible.   While, therefore, it is of importance that the
precise position of the head should be ascertained in order
that we may have an intelligent notion of its progress, I do
not think that it is essential as a guide to the introduction
of the forceps.

As a rule the lower blade, lightly grasped between the
tips of the index and middle fingers and thumb, should
be introduced first.   Poised in this way, we have perfect
command over it, and can appreciate in a moment any
obstacle to its passage.   Two or more fingers of the left
hand are introduced into the vagina, and by the side of the

Method of introducing the lower blade.

head, as a guide. The greatest care must be taken, if the cervix be within reach, that they are passed within it, so as to avoid the possibility of injury.

The handle of the instrument has to be elevated, and its point slid gently along the palmar surface of the guiding fingers, until it touches the head (fig. 161). At first the blade should be inserted in the axis of the outlet, but as it progresses, the handle must be depressed and carried backwards. As it is pushed onwards it is made to progress by a slight side-to-side motion, and it is of the utmost importance to bear in mind that the greatest gentleness must always be used. If any obstruction be felt, we are bound to withdraw the instrument, partially or entirely, and attempt to manœuvre, not force, the point past it. As the blade is guided on in this way, it is made to pass over the convexity of the head, the point being always kept slightly in contact with it, until it finally gains its proper position. When fully inserted the handle is drawn back towards the perinæum, and given in charge to an assistant. The insertion must be carried on only in the intervals between the pains, and desisted from during their occurrence; otherwise there would be a serious risk of injuring the soft parts of the mother.

The second blade is passed directly opposite to the first, and is generally somewhat more difficult to introduce, in consequence of the space occupied by the latter. It is passed along two fingers directly opposite the first blade, and with exactly the same precautions as to direction and introduction, except that at first its handle has to be depressed instead of elevated (fig. 162).

The handle which was in charge of the assistant is now laid hold of by the operator, and the two handles are drawn together. If the blades have been properly introduced, there should be no difficulty in locking; but should we be unable to join them easily, we must withdraw one or other, either partially or entirely, and reintroduce it with the same precautions as before. We must also assure ourselves that no hairs, nor any of the maternal structures, are caught in the lock.

When once the blades are locked we may commence our efforts at traction. To do this we lay hold of the handles with the right hand, using only sufficient compression to give

a firm grasp of the head, and to keep the blades from slipping. The left hand may be advantageously used in assisting and supporting the right during our efforts at extraction, and, at a late stage of the operation, may be employed in relaxing the perinæum when stretched by the head of the child. Traction must always be made in reference to the pelvic axes, being at first backwards towards the perinæum (fig. 163), in the direction of the axis of the brim, and as the head descends and the vertex protrudes through the vulva,

Fig. 163.
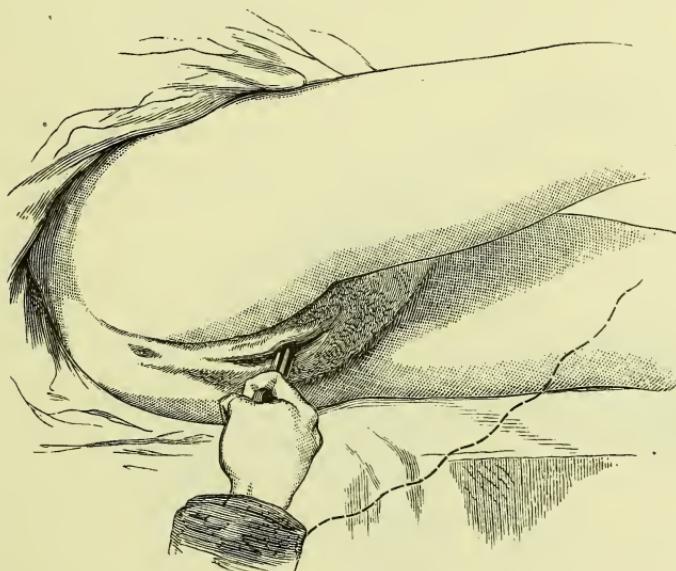
FORCEPS IN POSITION. TRACTION IN THE AXIS OF THE BRIM, DOWNWARDS
AND BACKWARDS.

it must be changed to that of the outlet (fig. 164). If the axis-traction forceps is used, it is to be borne in mind that traction is to be made by the traction handle only, the handles of the instrument itself being left untouched after they are locked and the traction rods are united. By keeping these latter parallel to the handles of the forceps, traction can always be made in the proper direction. We must extract only during the pains; and, if these should be absent, we must imitate them by acting at intervals. This is a point which deserves special attention, for there is no more common error than undue hurry in delivery.

Necessity of avoiding undue haste in delivery.

The only valid objection I know of against a more frequent resort to the forceps in lingering labour is, that the sudden emptying of the uterus, in the absence of pains, may predispose to hæmorrhage ; but it cannot be denied that it is one of some weight. However, if due care be taken to operate slowly, and to allow several minutes to elapse between each tractive effort, while at the same time uterine contractions be stimulated by pressure and support, this need not be considered a contra-indication. Besides direct traction we may impart to the instrument a gentle waving motion from handle to handle, which brings into operation its power as a lever ; but this must be done only to a very slight extent, and must always be subservient to direct traction.

Side-to-side movement.

Proceeding thus in a slow and cautious manner, carefully regulating the force employed according to the exigencies of the case, we shall perceive that the head begins to descend ; and its progress should be determined, from time to time, by the fingers of the unemployed hand.

Descent of the head.

When the head lies in the oblique diameter, as it descends, in consequence of its perfect adaptation to the pelvic cavity, it will turn into the antero-posterior diameter without any effort on the part of the operator, provided only that the traction be sufficiently slow and gradual. As the head is about to emerge, it is necessary to raise the handles towards the mother's abdomen. More than usual care is required to prevent laceration of the perinæum, which is always much stretched (fig. 164). If, as often happens, the pains have now increased, and the perinæum be very thin and tense, it may even be desirable to remove the blades gently and leave the case to be terminated by the natural powers ; but if due precautions are used this need not be necessary.

The rotation from the oblique diameter takes place spontaneously.

Birth of the head.

The peculiarities of forceps delivery in occipito-posterior positions have already been discussed (vol. i. p. 390), and need not be repeated.

The forceps in occipito-posterior positions.

When the high forceps operation has been decided on, the passage of the blades will be found to be much more difficult from the height of the presenting part, the distance which they must pass, and, in some cases, from the mobility of the head interfering with their accurate adaptation. The general principles of introduction and of traction are, however, identical. If the operation be attempted before the

High forceps operations.

head has entered the pelvic brim, it must be fixed, as much
as possible, by abdominal pressure.   In guiding the blades
to the head special care must be taken to avoid any injury   Their
of the soft parts, especially if the cervix be not completely   peculi-
out of reach.   For this purpose it may even be advisable to   arities.
introduce the entire left hand as a guide, so as to avoid any
possibility of injuring the cervix, from not passing the in-
strument under its edge.

Fig. 164.
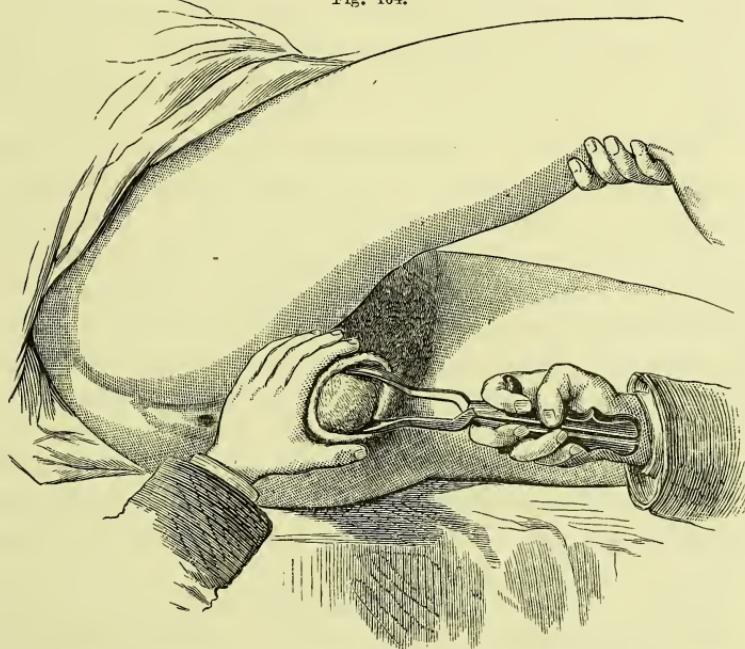
LAST STAGE OF EXTRACTION.   THE HANDLES OF THE FORCEPS ARE BEING GRADUALLY
TURNED UPWARDS TOWARDS THE MOTHER'S ABDOMEN.

Some authors advise that, in such cases, the blade should   Peculiar
be introduced at first opposite the sacrum, until the point   method
approaches its promontory.   It is then made to sweep round   of intro-
the pelvis, under the protecting fingers, till it reaches its   ducing the
proper position on the head.   This plan is advocated by   blades.
Ramsbotham, Hall Davis, and other eminent practical ac-
coucheurs, and it is certainly of service in some cases of
difficulty ; especially when, from any reason, it is not possible
to draw the nates over the edge of the bed, when the neces-
sary depression of the handle of the upper blade is difficult

to effect.   It involves, however, a somewhat complicated manœuvre, and it is seldom that the blades cannot be readily introduced in the usual way.

Necessity of care in locking.

In locking, the slightest approach to roughness must be carefully avoided, for the extremities of the blades are now within the cavity of the uterus, and serious injury might easily be inflicted. If difficulty be met with, rather than employ any force, one of the blades should be withdrawn, and reintroduced in a more favourable direction. If the blades have shanks of sufficient length, there should be no risk of including the soft parts of the mother in the lock, which, in a badly-constructed instrument, is an accident not unlikely to occur.

Method of traction.

After junction traction must at first be altogether in the axis of the brim, and to effect this the handles must be pressed well backwards towards the perinæum. As the head descends it will probably take the usual turn of itself, without effort on the part of the operator, and the direction of the tractive force may be gradually altered to that of the axis of the outlet. If the pains be strong and regular, and there be no indication for immediate delivery, we may remove the forceps after the head has descended upon the perinæum, and leave the conclusion of the case to nature. This course may be especially advisable if the perinæum and soft parts be unusually rigid; but generally it is better to terminate labour without removing the instrument.

Possible dangers of forceps delivery.

Before concluding this subject, reference may be made to the possible dangers of the operation. I would here again insist on the importance of distinguishing between the high and low forceps operations, which have been so unfortunately and unfairly confounded. Reasons have already been given for rejecting the statistics of the risks attending forceps delivery in the latter class of cases (vol. ii. p. 16). A formidable catalogue of dangers, both to mother and child, might easily be gathered from our standard works on obstetrics. Among the former the principal are lacerations of the uterus, vagina, and perinæum ; rupture of varicose veins, giving rise to thrombus ; pelvic abscess, from contusion of the soft parts ; subsequent inflammation of the uterus or peritoneum ; tearing asunder of the joints and symphyses ; and even fracture of the pelvic bones. A careful analysis of these,

such as has been so well made by Drs. Hicks and Phillips,[1] proves beyond doubt that the application of the instrument is not so much concerned in their production, as the protraction of the labour, and the neglect of the practitioner in not interfering sufficiently soon to prevent the occurrence of the evil consequences, afterwards attributed to the operation itself.   Many of these will be found to rise from the prolonged pressure on the soft parts within the pelvis and the subsequent inflammation or sloughing.   To these causes may be referred with propriety most cases of vesico-vaginal fistula (vol. ii. p. 138), peritonitis, and metritis following instrumental labour.

Most of these are not referable to the operation itself.

Lacerations and similar accidents may, however, result from an incautious use of the instrument.   Slight lacerations of the mucous membrane of the vagina are probably far from uncommon.   But if these cases were closely examined, it would be found that the fault lay not in the instrument, but in the hand that used it.   Either the blades were introduced without due regard to the axes of the pelvis, or they were pushed forwards with force and violence, or an instrument was employed unsuitable to the case (such as a short straight forceps when the head was high in the pelvis), or undue haste and force in delivery were used.   It would be manifestly unfair to lay the blame of such results upon the forceps, which, in the hands of a more judicious and experienced practitioner, would have effected the desired object with perfect safety.   The instrument is doubtless unsafe in the hands of anyone who does not understand its use, just as the scalpel or amputating knife would be in the hands of a rash and inexperienced surgeon.   The lesson to be learnt seems to be clearly, not that the dangers should deter us from the use of the forceps, but that they should induce us to study more carefully the cases in which it is applicable, and the method of using it with safety.

Some depend on ignorance on the part of the practitioner.

The dangers to the child are, principally, lacerations of the integuments of the scalp and forehead ; contusion of the face ; partial, but temporary, paralysis of the face from pressure of a blade on the facial nerve ; depression or fracture of the cranial bones ; injury to the brain from undue pressure of the blades.   These evils are of rare occurrence,

Possible risks to the child.

[1] *Obst. Trans.* vol. xiii.

and, when they do happen, generally result from improper
management of the operation—such as undue compression,
the use of improper instruments or excessive and ill-directed
efforts at traction—and cannot, therefore, be considered as
in any way contra-indicating the use of the instrument.
Many of the more common results, such as slight abrasions
of the scalp, or paralysis of the face, are transitory in their
nature and of no real consequence.

CHAPTER IV.

THE VECTIS.—THE FILLET.

In connection with the subject of instrumental delivery it is essential to say something of the use of the *vectis*, on account of the value which was formerly ascribed to it, which was at one time so great in this country that it became the favourite instrument in the metropolis; Denman saying of it that even those who employed the forceps were ' very willing to admit the equal, if not superior, utility and convenience of the vectis.' Even at the present day, there are practitioners of no small experience who believe it to be of occasional great utility, and use it in preference to the forceps in cases in which slight assistance only is required. In spite, however, of occasional attempts to recommend its use, the instrument has fallen into disfavour, and may be said to be practically obsolete.

The vectis, in its most approved form, consists of a single blade, not unlike that of a short straight forceps, attached to a wooden handle. A variety of modifications exists in its shape and size. The handle has been occasionally manufactured, for the convenience of carriage, with a hinge close to the commencement of the blade (fig. 165), or with a screw at the point where the handle and blade join. The power of the instrument, and the facility of introduction, depend very much on the amount of curvature of the blade. If this be decided, a firmer hold of the head is taken and greater tractive force is obtained, but the difficulty of introduction is increased.

When employed in the former way, the fulcrum is intended to be the hand of the operator; but the risk of using the maternal structures as a *point d'appui*, and the inevitable danger of contusion and laceration which must

The vecti was formerly much used in this country.

Nature of the instrument.

The vectis is used either as a lever or a tractor.

follow, constitute one of the chief objections to the operation. Its value as a tractor must always be limited and quite inferior to that of the forceps, while it is as difficult to introduce and manipulate.

Cases in which it is applicable.

The vectis has been recommended in cases in which the low forceps operation is suitable, provided the pains have not entirely ceased. There is no doubt that it may be quite capable of overcoming a slight impediment to the passage of the head. It is applied over various parts of the head, most commonly over the occiput, in the same manner, and with the same precautions, as one blade of the forceps. Dr. Ramsbotham says, ' We shall find it necessary to apply it to different parts of the cranium, and perhaps the face also, successively, in order to relieve the head from its fixed condition, and favour its descent.' Such an operation obviously requires quite as much dexterity as the application of the forceps ; while, if we bear in mind its comparatively slight power, and the risk of injury to the maternal structures, we must admit that the disuse of the instrument in modern practice is amply justified.

Fig. 165.

VECTIS WITH HINGED HANDLE.

Is sometimes of value in correcting malpositions of the head.

The vectis may, however, find a useful application when employed to rectify malpositions, especially in certain occipito-posterior presentations. This action of the instrument has already been considered (vol. i. p. 389), and, under such circumstances, it may prove of service where the forceps is inapplicable. When so employed it is passed carefully over the occiput, and, while the maternal structures are guarded from injury, downward traction is made during the continuance of a pain. So used, its application is perfectly simple and free from danger, and for this purpose it may be retained as part of the obstetric armamentarium.

The fillet.

The *fillet* is the oldest of obstetric instruments, having been frequently employed before the invention of the forceps, and even in the time of Smellie it was much used in the metropolis. It has since completely fallen out of favour as a scientific instrument, although its use is every now and again advocated, and it is certainly a favourite instrument

with some practitioners. This is to be explained by the apparent simplicity of the operation, and the fact that it can generally be performed without out the knowledge of the patient. The latter, however, is one strong reason why it should not be used.

Fig. 166.

WILMOT'S FILLET.

The fillet consists, in its most improved form (that which is recommended by Dr. Eardley Wilmot[1]) (fig. 166), of a slip of whalebone fixed into a handle, composed of two separate halves, which join into one. The whalebone loop is slipped over either the occiput or face, and traction used at the handle.

Nature of the instrument.

When applied over the face, after the head has rotated, it would probably do no harm; but if it were so placed when the head was high in the pelvis, traction would necessarily produce extension of the chin before the proper time, and would thus interfere with the natural mechanism of delivery. If placed over the occiput, it is impossible to make traction in the direction of the pelvic axes, as the instrument will then infallibly slip. If traction be made in any other direction, there must be a risk of injuring the maternal structures, or of changing the position of the head. Hence there is every reason for discarding the fillet as a tractor, or as a substitute for the forceps, even in the simplest cases.

Objections to its use.

It is quite possible that it may find a useful application in certain cases in which the vectis may also be used, viz., as a rectifier of malposition; and, from the comparative facility of its introduction, it would probably be the perferable instrument of the two.

Its use in certain malpositions of the head.
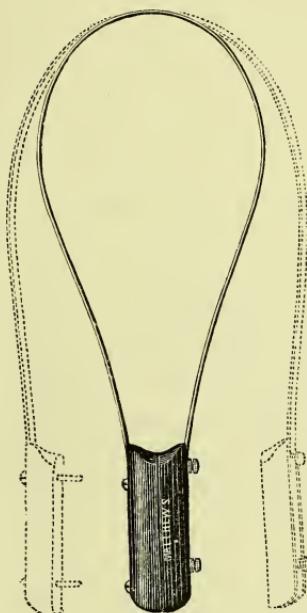
[1] *Obst. Trans.* vol. xv.

CHAPTER V.

OPERATIONS INVOLVING DESTRUCTION OF THE FŒTUS.

Opera-
tions
involving
the de-
struction
of the
fœtus are
of great
antiquity.

OPERATIONS involving the destruction and mutilation of the child were among the first practised in midwifery. Craniotomy was evidently known in the time of Hippocrates, as he mentions a mode of extracting the head by means of hooks. Celsus describes a similar operation, and was acquainted with the manner of extracting the fœtus in transverse presentations by decapitation. Similar procedures were also practised and described by Aetius and others among the ancient writers. The physicians of the Arabian school not only employed perforators for opening the head, but were acquainted with instruments for compressing and extracting it.

Religious
objections
to cranio-
tomy.

Until the end of the seventeenth century this class of operation was not considered justifiable in the case of living children; it then came to be discussed whether the life of the child might not be sacrificed to save that of the mother. It was authoritatively ruled by the Theological Faculty of Paris, that the destruction of the child in any case was mortal sin. ' Si l'on ne peut tirer l'enfant sans le tuer, on ne peut sans péché mortel le tirer.' This dictum of the Roman Church had great influence on Continental midwifery, more especially in France, where, up to a recent date, the leading obstetricians considered craniotomy to be only justifiable when the death of the fœtus had been positively ascertained. Even at the present day there are not wanting practitioners who, in their praiseworthy objection to the destruction of a living child, counsel delay until the child has died; a practice thoroughly illogical, and only sparing the operator's feelings at the cost of greatly increased risk to the mother. In England, the safety of the child has always been considered subservient to that of the mother; and it has been

admitted that, in every case in which the extraction of a living fœtus by any of the ordinary means is impossible, its mutilation is perfectly justifiable.

It must be admitted that the frequency with which craniotomy has been performed in this country constitutes a great blot on British Midwifery. During the mastership of Dr. Labbat, at the Rotunda Hospital, the forceps was never once applied in 21,867 labours. Even in the time of Clarke and Collins, when its frequency was much diminished, craniotomy was performed three or four times as often as forceps delivery. These figures indicate a destruction of fœtal life which we cannot look back to without a shudder, and which, it is to be feared, justify the reproaches which our Continental brethren have cast upon our practice. Fortunately, professional opinion has now completely recognised the sacred duty of saving the infant's life whenever it is practicable to do so ; and British obstetricians now teach, as carefully as those of any other nation, the imperative necessity of using every endeavour to avoid the destruction of the fœtus.

The operation now under consideration may be necessary : 1st, when the head requires either to be simply perforated, or afterwards more completely broken up and extracted—an operation which has received various names, but is generally known in this country as *craniotomy*, and which may or may not require to be followed by further diminution of the trunk ; 2ndly, when the arm presents, and turning is impossible. This necessitates one of two procedures—*decapitation*, with the separate extraction of the body and head, or *evisceration*. In both classes of cases similar instruments are employed, and those generally in use at the present time may be first briefly described.

1. The object of the *perforator* is to pierce the skull of the child, so as to admit of the brain being broken up, and the consequent collapse and diminution in size of the cranium. The perforator invented by Denman, or some modification of it, has been principally employed. It requires the handles to be separated in order to open the blades, and this cannot be done by the operator himself. This difficulty is overcome in the modification of Naegele's perforator used in Edinburgh, in which the handles are so constructed that they

open the points when pressed together, and are separated by
a steel rod, with a joint at its centre, to prevent their opening
too soon.   By this arrangement the instrument can be mani-
pulated by one hand only. The sharp-pointed portion has
an external cutting edge, with projecting shoulders at its
base, to prevent its penetrating too far into the cranium.
Many modifications of these arrangements have since been
contrived (figs. 167, 168, 169).   In some parts of the Conti-
nent a perforator is used constructed on the principle of the
trephine ; but this is vastly more difficult to work, and has

Fig. 167.   Fig. 168.   Fig. 169.
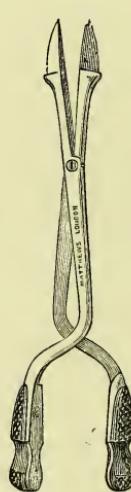
VARIOUS FORMS OF PERFORATORS.

the great disadvantage of simply boring a hole in the skull,
instead of splitting it up, as is done by the sharp-pointed
instrument.

The instruments for extraction are the *crotchet* and
craniotomy forceps.

Crotchets
and cra-
niotomy
forceps.

The crotchet is a sharp-pointed hook of highly-tempered
steel, which can be fixed on some portion of the skull, either
internal or external, traction being made by the handle.
The shank of the instrument is either straight or curved
(figs. 170 and 171), the latter being preferable, and it is
either attached to a wooden handle or forged in a single
piece of metal.   A modification of this instrument is known
as *Oldham's vertebral hook*.   It consists of a slender hook,

measuring, with its handle, 13 inches in length, which is passed through the foramen magnum, and fixed in the vertebral canal, so as to secure a firm hold for traction. All forms of crotchets are open to the serious objection of being liable to slip, or break through the bone to which they are fixed, so wounding either the soft parts of the mother, or the fingers of the operator placed as a guard. Hence they are discountenanced by most recent writers, and may with propriety be regarded as obsolete instruments.

Objections to crotchets.

Figs. 170, 171.
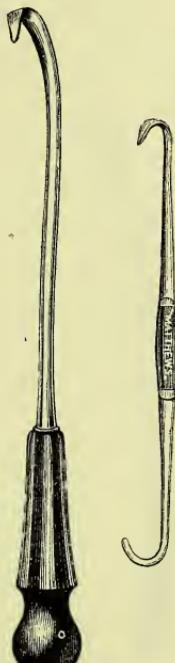
Their place as tractors is well supplied by the more modern craniotomy forceps (fig. 172). These are intended to lay hold of the skull, one blade being introduced within the cranium, the other externally, and, when a firm grasp has been obtained, downward traction is made. A second object it fulfils is, to break away and remove portions of the skull, when perforation and traction alone are insufficient to effect delivery. Many forms of craniotomy forceps are in use ; some armed with formidable teeth ; others, of simpler construction, depending on their roughened and serrated internal surfaces for firmness of grasp. For general use, there is no better instrument than the *cranioclast* of Sir James Simpson (fig. 173), which admirably fulfils both these indications. It consists of two separate blades, fastened by a button joint. The extremities of the blades are of a duck-billed shape, and are sufficiently curved to allow of a firm grasp of the skull being taken : the upper blade is deeply grooved to allow the lower to sink into it, and this gives the instrument great power in fracturing the cranial bones, when that is found to be necessary. It need not, however, be employed for the latter purpose ; and, the blades being serrated on their under surface, form as perfect a pair of craniotomy forceps as any in ordinary use. Provided with it, we are spared the necessity of procuring a number of instruments for extraction.

Craniotomy forceps are preferable for extraction.

CROTCHETS.

Simpson's cranioclast.

Amongst modern improvements in midwifery there are few which have led to more discussion than the use of the *cephalotribe*. This instrument, originally invented by Baudelocque, was long employed on the Continent before it was used in this country, the prejudice against it being no doubt due to its formidable size and appearance. Of late years many of our leading obstetricians have used it in preference either to the crotchet or craniotomy forceps, and have

Fig. 172.   Fig. 173.
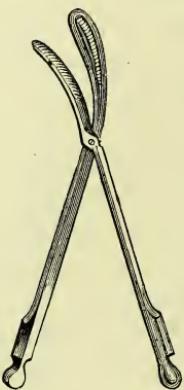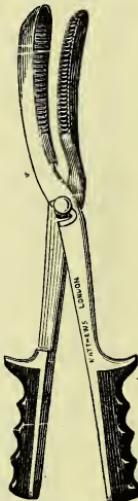
CRANIOTOMY FORCEPS.   SIMPSON'S CRANIOCLAST.

materially modified and improved its construction, so that the most objectionable features of the older instruments are now entirely removed.

The cephalotribe consists of two powerful solid blades, which are applied to the head after perforation, and approximated by means of a screw so as to crush the cranial bones, and after this it may be also used for extraction. The pecu-

liar value of the instrument is, that, when properly applied, it crushes the firm basis of the skull, which is left untouched by craniotomy; or, if it does not, it at least causes the base to turn edgeways within the blades, so as to be in a more favourable position for extraction. Another and specially valuable property is, that it crushes the bones *within* the scalp, which forms a most efficient protective covering to their sharp edges. In this way one of the principal dangers

of craniotomy—the wounding of the maternal passages by spiculæ of bone—is entirely avoided.

The cephalotribe, therefore, acts in two ways : as a crusher, and as a tractor. Some obstetricians believe the former to be its more important use, and even maintain that the cephalotribe is unsuited for traction. This view is specially maintained by Pajot, who teaches that, after the size of the skull has been diminished by repeated crushings, its expulsion should be left to the natural powers. There are some grounds for believing that in the greater degrees of obstruction the tractile power of the instrument should not be called into use ; but, in the large majority of cases, the facility with which the crushed head may be withdrawn by it constitutes one of its chief claims to the attention of the obstetrician. No one who has used it in this way, and experienced the rapid and easy manner in which it accomplishes delivery, can have any doubt on this point.

Some obstetricians object to using it as a tractor.

Fig. 174.

HICKS'S CEPHALOTRIBE.
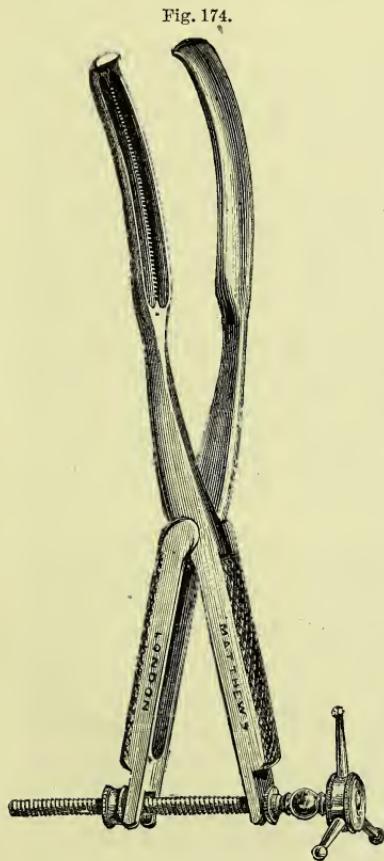
There is every reason to believe that cephalotripsy will be much extended in this country, and that it will be considered, as I believe it unquestionably deserves to be, the ordinary operation in cases requiring destruction of the fœtus. The comparative merits of cephalotripsy and craniotomy will be subsequently considered.

Its value.

The most perfect cephalotribe is probably that known as Braxton Hicks's (fig. 174), which is a modification of Simpson's. It is not of unwieldy size, but sufficiently powerful for any case, and not extravagant in price. The blades have

Description of the instrument.

a slight pelvic curve, which materially facilitates their introduction, yet not sufficiently marked to interfere with their being slightly rotated after application. Dr. Kidd, of Dublin, prefers a straight blade; while Dr. Matthews Duncan thinks it better to use a somewhat bulkier instrument, modelled on the type of the Continental cephalotribes. The principle of action of all these is identical, and their differences are not of very material importance.

Section of the skull by the forceps saw, or écraseur.

Another mode of diminishing the fœtal skull is by removing it in sections. The object is aimed at in the *forceps saw* of Van Huevel, which consists of two large blades, not unlike those of the cephalotribe in appearance. Within these there is a complicated mechanism, working a chain-saw from below upwards, which cuts through the fœtal skull; the separated portions are subsequently withdrawn piecemeal. This instrument is highly spoken of by the Belgian obstetricians, who believe that it affords by far the safest and most effectual way of reducing the bulk of the fœtal skull. In this country it is practically unknown; and, although it must be admitted to be theoretically excellent, the complexity and cost of the apparatus have always stood in the way of its being used.

Dr. Barnes has suggested that the same results may be obtained by dividing the head with a strong wire *écraseur*. So far as I know, this suggestion has never yet been carried out in practice, not even by himself, and, therefore, it is not possible to say much about it. I should imagine, however, that there would be considerable difficulty in satisfactorily passing the loop of wire over the skull in a pelvis in which there is any well-marked deformity.

Cases requiring craniotomy.

Deformity of the pelvis.

The most common cause for which craniotomy or cephalotripsy is performed is a want of proper proportion between the head and the maternal passages. This may arise from a variety of causes. The most important, and that most often necessitating the operation, is osseous deformity. This may exist either in the brim, cavity, or outlet, and it is most often met with in the antero-posterior diameter of the brim. Obstetric authorities differ considerably as to the precise amount of contraction which will prevent the passage of a living child at term. Thus Clarke and Burns believe that 'a living child cannot pass through a pelvis in which the antero-posterior

diameter at the brim is less than $3\frac{1}{4}$ inches. Ramsbotham fixes the limit at 3 inches, and Osborne and Hamilton at $2\frac{3}{4}$ inches. The latter is the extreme limit at which the birth of a living child is possible ; but there can be no doubt that, under favourable circumstances, it may be possible to draw the fœtus, after turning, through a pelvis of that size. The opposite limit of the operation is still more open to discussion. Various authorities have considered it quite possible to draw a mutilated fœtus through a pelvis in which the antero-posterior diameter does not exceed $1\frac{1}{2}$ inches, and, indeed, have succeeded in doing so. But then there must be a fair amount of space in the transverse diameter of the pelvis to admit of the necessary manipulations. If there be a clear space here of 3 inches and upwards, it is no doubt possible to deliver *per vias naturales* ; but in such extreme deformities, the difficulties are so great, and the bruising of the maternal structures so extensive, that it becomes an operation of the greatest possible severity, with results nearly as unfavourable to the mother as the Cæsarean section. Hence some Continental authorities have not scrupled to prefer the latter operation in the worst forms of pelvic deformity. The rule in English practice always has been that craniotomy must be performed whenever it is practicable ; and there can be no doubt that it is the right one. *[marginal note: Dangers of the operation in cases of extreme pelvic deformity.]*

Between from $2\frac{3}{4}$ to 3 inches antero-posterior diameter in the one direction, $1\frac{3}{4}$ inches in the other, may be said to be the limits of craniotomy, provided, in the latter case, there be a fair amount of space in the transverse diameter. The same limits may be laid down with regard to tumours or other sources of obstruction. *[marginal note: Limits of the operation.]*

There are a few other conditions in which craniotomy is justifiable, independently of pelvic contraction, such as certain conditions of the soft parts which are supposed to render the passage of the head peculiarly dangerous to the mother. Among them may be mentioned swelling and inflammation of the vagina from the length of the previous labour, bands, and cicatrices of the vagina, and occlusion and rigidity of the os. It is hardly too much to say that with a proper use of the resources of midwifery, the destruction of a living fœtus for any of these conditions might be obviated. The most common of them is undoubtedly swelling of the *[marginal note: Other causes justifying craniotomy.]* *[marginal note: In most of these cases the destruction of the]*

soft parts causing impaction of the head, an occurrence which ought to be invariably prevented by a timely use of the forceps. Should interference unfortunately be delayed until impaction has actually taken place, doubtless no other resource but craniotomy would be left; but such cases, it is to be hoped, are now of rare occurrence in British practice. Undue rigidity of the os can be overcome by dilatation with the caoutchouc bags, or, in more serious cases, by incision, which would certainly be less perilous to the mother than dragging even a mutilated fœtus through the small and rigid aperture. In the case of bands and cicatrices in the vagina, dilatation or incision will generally suffice to remove the obstruction; but even were this not so, here, as in excessive rigidity of the perinæum, it would be better that slight lacerations should take place, than that the child should be killed.

Certain complications of labour are held to justify craniotomy, such as rupture of the uterus, convulsions, and hæmorrhage. The application of the forceps or turning will generally answer our purpose equally well, especially as we have the means of dilating the os sufficiently to admit of one or other of them being performed, when the natural dilatation is not sufficient. Craniotomy in rupture of the uterus will also be rarely indicated, as we have seen that gastrotomy appears to afford a better chance to the mother in those cases in which the fœtus has partially or entirely escaped from the uterine cavity.

Want of proportion between the fœtus and the pelvis, depending on undue size of the head, either natural or the result of disease, may render the operation essential. In the former of these cases we shall generally have first attempted delivery with the forceps, and, if it has failed, there can be no doubt as to the propriety of lessening the bulk of the head by perforation.

In most obstetric works we are recommended to perforate rather than apply the forceps, when we are convinced that the child has ceased to live. This advice is based on the greater facility with which craniotomy can be performed, and its supposed greater safety to the mother. There can be no doubt of the ease with which the child can be extracted after perforation, when the pelvis is not contracted; and, if we

could always be sure of our diagnosis, the rule might be a good one. Before acting on it, however, we must bear in mind the extreme difficulty of positively ascertaining the death of the fœtus. Of the signs usually relied on for this purpose, there are scarcely any which are not open to fallacy, except peeling of the scalp, and disintegration of the cranial bones, which do not take place unless the child has been dead for a length of time, and are, therefore, useless, in most instances. Discharge of the meconium constantly takes place when the child is alive ; a cold and pulseless prolapsed cord may belong to a twin ; and the fœtal heart may become temporarily inaudible, although the child is not dead. If, indeed, we have carefully watched the fœtal heart all through the labour, and heard it become more and more feeble, and finally stop altogether, we might be certain that the child has died ; but surely such observations would rather indicate an early recourse to the forceps or version, so as to obviate the fatal result we know to be impending ? *Difficulty of determining the death of the fœtus.*

In certain breech presentations, or after turning, it may be found impossible to extract the head, without diminishing its size by perforating behind the ear. In such cases we know to a certainty whether the child be alive or dead, before resorting to the operation. *Perforation of the aftercoming head.*

The first step, whether we resort to cephalotripsy or craniotomy, is perforation, which will, therefore, be first described. In the former the desirability of first perforating the head is not always recognised. To endeavour to crush the head without perforating is needlessly to increase the difficulties of the case, and it should be remembered, as a cardinal rule, that perforation is an essential preliminary to the proper use of the cephalotribe. *Perforation is an essential preliminary both in craniotomy and cephalotripsy.*

Before perforating we must carefully ascertain the exact relation of the os to the presenting part, since, in many cases, the operation is performed before the os is fully dilated, when there is a risk of wounding the cervix. Two or more fingers of the left hand should be passed up to the head, and placed against the most prominent part of the parietal bone. Under these, used as guard (fig. 175), the perforator should be cautiously introduced until the scalp is reached. It is important to fix on a bony part of the skull, and not on a suture or fontanelle, for puncture, because our object is to break up *Method of perforation.*

the vault of the cranium as much as possible, so as to allow the skull to collapse. When the instrument has reached the point we have selected, it should be made to penetrate the scalp and skull with a semi-rotatory boring motion, and advanced until it has sunk up to the rests, which will oppose its further progress. Occasionally considerable force will be necessary to effect penetration, more especially if the scalp

Penetration of the skull.

Fig. 175.
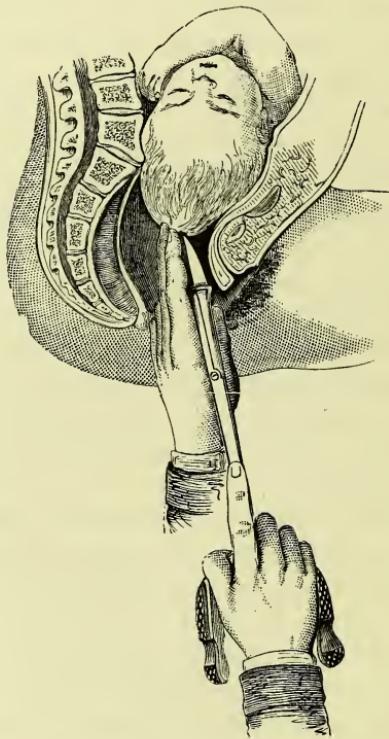
PERFORATION OF THE SKULL.

be swollen by long-continued pressure; and this stage of the operation will be facilitated by causing an assistant to steady the head by pressure on the fœtus through the abdomen, more especially if it be still free above the pelvic brim. We must then press together the handles of the instrument, which will have the effect of widely separating the cutting portion, and making an incision through the bones. After this the point should be turned round, and again opened at right angles to the former incision, so as to make a free

crucial opening.   During this process care must be taken to bury the perforator in the skull up to the rests, so as to avoid the possibility of injuring the maternal soft parts.   The instrument should now be introduced within the skull and moved freely about, so as to thoroughly and completely break up the brain.   Especial care must be taken to reach the medulla oblongata and base of the brain, for, if these were not destroyed, we might subject ourselves to the distress of extracting a child in whom life was not extinct.   If this part of the operation be thoroughly performed, there will be no necessity for washing out the brain by the injection of warm water, as is sometimes recommended, for the broken-up tissue will escape freely through the opening made by the perforator. Breaking up of the brain.

The perforation of the after-coming head does not generally offer any particular difficulty.   It is accomplished in the same manner, the child's body being well drawn out of the way by an assistant.   The point of the perforator, carefully guarded by the finger, is guided up to the occiput, or behind the ear, where it is inserted. Perforation of the after-coming head.

If there be no necessity for very rapid delivery, and the pains be still present, it is often advisable to wait ten minutes or a quarter of an hour before proceeding to extract.   This delay will allow the skull to collapse and become moulded to the cavity of the pelvis, when forced down by the pains, and possibly the natural effort may suffice to finish the labour in that time ; or, at least, the head will have descended further, and will be in a better position for extraction.   Should perforation be required after having failed to deliver with the forceps—and this is only likely to be the case when the obstruction is comparatively slight—it is certainly a good plan to perforate without removing the forceps, which may then be used as tractors. It is sometimes useful to postpone extraction.

In some cases perforation may be performed without removing the forceps previously employed.

We have now to decide on the method of extraction, and our choice generally lies between the cephalotribe and the craniotomy forceps, although in some few cases, in which the pelvic contraction is slight, version may be advantageously employed.

Those who have used both must, I think, admit that in any ordinary case, in which the obstruction is not great, and only a comparatively slight diminution in the size of the Comparative merits of cephalotripsy

head is required, cephalotripsy is infinitely the easier opera-
tion. The facility with which the skull can be crushed is
sometimes remarkable, and those who will take the trouble
to read the reports of the operation published by Braxton
Hicks, Kidd, and others cannot fail to be struck with the
rapidity with which the broken-down head may often be
extracted. This is far from being the case with the cranio-
tomy forceps, even when the obstruction is moderate only ;
for it may be necessary to use considerable traction, or the
blades may take a proper grasp with difficulty, or it may be
essential to break down and remove a considerable portion of
the vault of the cranium before the head is lessened suf-
ficiently to pass. During the latter process, however carefully
performed, there is a certain risk of injuring the maternal
structures, and, in the hands of a nervous or inexperienced
operator, this danger, which is entirely avoided in cephalo-
tripsy, is far from slight. The passage of the blades of the
cephalotribe is by no means difficult, and I think it must be
admitted that the possible risks attending it are comparatively
small. On account, therefore, of its simplicity and safety to the
maternal structures, I believe cephalotripsy to be decidedly
the preferable operation in all cases of moderate obstruction.

When we approach the lower limit, and have to do with
a very marked amount of pelvic deformity, the two operations
stand on a more equal footing. Then the deformity may be
so great as to render it difficult to pass the blades of even
the smallest cephalotribe sufficiently deep to grasp the head
firmly, and, even when they are passed, the space is often so
limited as to impede the easy working of the instrument.
Besides this, repeated crushings may be required to diminish
the skull sufficiently. I attach but little importance to the
argument that the diminution of the skull in one diameter
increases its bulk in another. The necessity of removing
and replacing the blades on another part of the skull, and of
repeating this perhaps several times, in the manner recom-
mended by Pajot, is a far more serious objection. To do
this in a contracted pelvis involves, of necessity, the risk of
much contusion. Fortunately cases of this kind are of ex-
treme rarity, much more so than is generally believed, but
when they do occur they tax the resources of the practitioner
to the utmost.

On the whole, the conclusion I would be inclined to arrive at with regard to the two operations is, that in all ordinary cases cephalotripsy is safer and easier, whereas in cases with considerable pelvic deformity, the advantages of cephalotripsy are not so well marked, and craniotomy may even prove to be preferable.

The first step in using the cephalotribe is the passage of the blades. These are to be inserted in precisely the same manner, and with the same precautions, as in the high forceps operation. In many cases the os is not fully dilated, and it is absolutely essential to pass the instrument within it. Special care should, therefore, be taken to avoid any injury to its edges, and, for this purpose, two or three fingers of the left hand, or even the whole hand, should be passed high up, so as thoroughly to protect the maternal structures. In order that the base of the skull may be reached and effectually crushed, the blades must be deeply inserted, and, in doing this, great care and gentleness must be used. As the projecting promontory of the sacrum generally tilts the head forwards, the handles of the instrument, after locking, must be well pressed backwards towards the perinæum. If the blades do not lock easily, or if any obstruction to their passage be experienced, one of them must be withdrawn and reintroduced, just as in forceps operations. Care must be taken, as the instrument is being inserted, to fix and steady the head by abdominal pressure, since it is generally far above the brim, and would readily recede if this precaution were neglected. When the blades are *in situ*, we proceed to crush by turning the screw slowly, and as the blades are approximated, the bones yield, and the cephalotribe sinks into the cranium. The crushed portion then measures, of course, no more than the thickness of the blades, that is, about 1½ inches. This is necessarily accompanied by some bulging of the part of the cranium that is not within the grasp of the instrument (fig. 176), but in slight deformity this is of no consequence, and we may proceed to extraction, waiting, if possible, for a pain, and drawing at first downwards in the axis of the pelvic inlet, as in forceps delivery, then in the axis of the outlet. The site of perforation should be examined to see that no spiculæ of bone are projecting from it, and if so they should be carefully removed.

Description of the operation.

Introduction of the blades.

Care must be taken to fix the head by abdominal pressure.

Extraction after crushing.

In such cases the head often descends at once, and with the greatest ease. Should it not do so, or should the obstruction be considerable, a quarter turn should be given to the handles of the instrument, so as to bring the crushed portion into the narrower diameter, and the uncrushed portion into the wider transverse diameter. It may now be advisable to remove the blades carefully, and to reintroduce them with the same precautions so as to crush the unbroken portion of the skull. This adds materially to the difficulties of the case, since the blades have a tendency to fall into the deep channel already made in the cranium, and so it is by no means always easy to seize the skull in a new direction. Before re-applying them, if the condition of the patient be good and pains be present, it may be well to wait an hour or more, in the hope of the head being moulded and pushed down into the pelvic cavity. This was the plan adopted by Dubois, and, according to Tarnier, was the secret of his great success in the operation. Pajot's method of repeated crushings, in the greater degrees of contraction, is based on the same idea, and he recommends that the instrument should be introduced at intervals of two, three, or four hours, according to the state of the patient, until the head is thoroughly crushed; no attempts at traction being used, and expulsion being left to the natural powers. This, he says, should always be done when the contraction is below $2\frac{1}{2}$ inches, and he maintains that it is quite possible to effect delivery by this means when there is only $1\frac{1}{2}$ inches in the antero-posterior diameter. The repeated introduction of the blades in this fashion must necessarily be hazardous,

It is sometimes advisable to rotate the head before extraction.

A second introduction of the blade is sometimes required.

Pajot's plan of repeated crushings.

Fig. 176.

FŒTAL HEAD CRUSHED BY THE
CEPHALOTRIBE.

except in the hands of a very skilful operator; and I believe that if a second application fail to overcome the difficulty, which will only be very exceptionally the case, it would be better to resort to the measures presently to be described.

Professor Simpson, of Edinburgh,[1] has recently suggested the use of an instrument which he calls a 'Basilyst.' Its object is to break up the base of the fœtal skull from within, after the method originally proposed by Guyon. The screw-like portion of the instrument (fig. 177), which is inserted through the perforation made in the cranial vault, is driven through the hard base, which is then disintegrated by the separate movable blade. If experience proves that this instrument can be readily worked, it promises to be a valuable addition to our armamentarium, since it will effectually destroy the most resistant portion of the skull, without risk of injury to the maternal structures, and thus very materially facilitate extraction.

Destruction of the base of the skull from within by the basilyst.

Fig. 177.

PROFESSOR SIMPSON'S BASILYST.

Should we elect to trust to the craniotomy forceps for extraction, one blade is to be introduced through the perforation, and the other, in apposition to it, on the outside of the scalp. In moderate deformities, traction applied during the pains may of itself suffice to bring down the head. Should the obstruction be too great to admit of this, it is necessary to break down and remove the vault of the cranium. For this purpose Simpson's cranioclast answers better than any other instrument. One of the blades is passed within the cranium, the other, if possible, between the scalp and the skull, and the portion of bone grasped between them is broken off; this can generally be accomplished by a twisting motion of the wrist, without using much force. The separated portion of bone is then extracted, the greatest care being taken to guard the maternal structures, during its removal, by the fingers of the left hand. The instrument is then applied to a fresh part of the skull, and the same process repeated, until as much of the vault of the cranium as may be necessary is broken up and removed.

Extraction by the craniotomy forceps.

Breaking down and removal of the cranial vault.

[1] *Edin. Med. Journ.* April 1880.

Advantages of bringing down the face in difficult cases.

Dr. Braxton Hicks[1] has conclusively shown that in difficult cases, after the removal of the cranial vault, the proper procedure is to bring down the face; since the smallest measurement of the skull after the removal of the upper part of the cranium is from the orbital ridge to the alveolar edge of the superior maxillary bone. This alteration in the presentation he proposes to effect by a small blunt hook, made for the purpose, which is forced into the orbit, by means of which the face is made to descend. Barnes recommends that this should be done by fixing the craniotomy forceps over the forehead and face, and making traction in a backward direction, so as to get the face past the projecting promontory of the sacrum. The importance of bringing down the face was long ago pointed out by Burns, but it had been lost sight of, until Hicks again drew attention to it in the paper referred to. In the class of cases in which this procedure is valuable, the risk to the maternal passages, from the removal of the fractured portions of bone, must always be considerable, and it is of great importance not only to preserve the scalp as entire as possible, so as to protect them, but to use the utmost possible care in removing the broken pieces of bone.

Importance of preserving the scalp.

Extraction of the body.

When the extraction of the head has been effected, either by the cephalotribe or the craniotomy forceps, there is seldom much difficulty with the body. By traction on the head one of the axillæ can easily be brought within reach, and if the body do not readily pass, the blunt hook should be introduced, and traction made until the shoulder is delivered. The same can then be done with the other arm. If there be still difficulty, the cephalotribe may be used to crush the thorax. The body is, however, so compressible that this is rarely required.

Embryotomy in transverse presentations in which turning is impossible.

There only remains for us to consider the second class of destructive operations. These may be necessary in long-neglected cases of arm presentation, in which turning is found to be impracticable. Here fortunately the question of killing the fœtus does not arise, since it will, almost necessarily, have already perished from the continuous pressure. We have two operations to select from, *decapitation* and *evisceration*.

[1] *Obst. Trans.* vol. vii.

The former of these is an operation of great antiquity, having been fully described by Celsus. It consists in severing the neck, so as to separate the head from the body ; the body is then withdrawn by means of the protruded arm, leaving the head in utero to be subsequently dealt with. If the neck can be reached without great difficulty—and, in the majority of cases, the shoulder is sufficiently pressed down into the pelvis to render this quite possible—there can be no doubt that it is much the simpler and safer operation.

The whole question rests on the possibility of dividing the neck. For this purpose many instruments have been invented. The one generally recommended in this country is known as Ramsbotham's hook, and consists of a sharply curved hook, with an internal cutting edge. This is guided over the neck, which is divided by a sawing motion. There is often considerable difficulty in placing the instrument over the neck, although, if this were done, it would doubtless answer well. Others have invented instruments, based on the principle of the apparatus for plugging the nostrils, by means of which a spring is passed round the neck, and to the extremity of the spring a short cord, or the chain of an écraseur, is attached ; the spring is then withdrawn and brings the chain or cord into position. The objection to any of these apparatuses is, that they are unlikely to be at hand when required, for few practitioners provide themselves with costly instruments which they may never require. It is of importance, therefore, that we should have at our command some means of dividing the neck, which is available in the absence of any of these contrivances. Dubois recommends for this purpose a strong pair of blunt scissors. The neck is brought as low as possible by traction on the prolapsed arm, and the blades of the scissors guided carefully up to it. By a series of cautious snipping movements it is then completely divided from below upwards. This, if the neck be readily within reach, can generally be effected without any particular difficulty. Dr. Kidd, of Dublin,[1] who strongly advocates this operation, recommends that an ordinary male elastic catheter, strongly curved and mounted on a firm stilet, or, still better, on a uterine sound, should be passed round the neck.

Decapitation.

Methods of dividing the neck.

[1] *Dublin Quart. Journ.* May 1871.

Previous to introduction a cord should be attached to the extremity of the catheter, which is left round the neck when it is withdrawn. By means of this cord a strong piece of whipcord, or the wire of an écraseur, can easily be drawn round the neck and used for dividing it. The former, to protect the maternal structures, may be worked through a speculum, and by a series of lateral movements the neck is easily severed. The écraseur, however, offers special advantage, since it entirely does away with any risk of injuring the mother.

With-drawal of the body and de-livery of the head.

After the neck is divided the remainder of the operation is easy. The body is withdrawn without difficulty by the arm, and we then proceed to deliver the head. By abdominal pressure this, in most cases, can be pushed down into the pelvis, so as to come easily within reach of the cephalotribe, which is by far the best instrument for extraction. Preliminary perforation is not necessary, since the brain can escape through the severed vertebral canal. The secret of doing this easily is to fix and press down the head sufficiently from above, otherwise it would slip away from the grasp of the instrument. The perforator and craniotomy forceps may be used, if the cephalotribe be not at hand. Perforation is, however, by no means always easy, on account of the mobility of the head. After it is accomplished one blade of the craniotomy forceps is passed within the skull, the other externally, and the head slowly drawn down.

Eviscera-tion.

The alternative operation of evisceration is a much more troublesome and tedious procedure, and should only be used when the neck is inaccessible. The first step is to perforate the thorax at its most depending part, and to make as wide an opening into it as possible, in order to gain access to its contents. Through this the thoracic viscera are removed piecemeal, being first broken up as much as possible, by the perforator, and then, the diaphragm being penetrated, those in the abdomen. The object is to allow the body to collapse, and the pelvic extremities to descend, as in spontaneous evolution. This can be much facilitated by dividing the spinal column with a strong pair of scissors, introduced into the opening made in the thorax, so that the body may be doubled up as on a hinge. Here the crotchet may find a useful application, for it can be passed through the abdominal

cavity, and fixed on some point in the interior of the child's pelvis; and thus strong traction can be made without any risk of injury to the mother. It can be readily understood that this process is so lengthy and difficult as to render it probably the most trying of obstetric operations; it is certainly inferior in every respect to decapitation, and is only to be resorted to when that is impracticable.[1]

[1] In nine cases of impaction of the fœtus in a transverse position, in the United States, the Cæsarean operation has been performed, owing to great difficulty in accomplishing either decapitation or evisceration, and six of the women were saved. The three deaths were from exhaustion.— Harris's note to third American edition.

CHAPTER VI.

THE CÆSAREAN SECTION—PORRO'S OPERATION.
SYMPHYSEOTOMY.

History of the Cæsarean section.

THE Cæsarean section has perhaps given rise to more discussion than any other subject connected with midwifery, and there is yet much difference of opinion as to the limits of, and indications for, the operation. The period at which the Cæsarean section was first resorted to is not known with accuracy. It seems to have been practised by the Greeks, after the death of the mother; and Pliny mentions that Scipio Africanus and Manlius were born in this way. The name of Cæsar is said to have been given to children so extracted, and afterwards to have been assumed as a family patronymic. These children were dedicated to Apollo; whence arose the practice of things sacred to that god being taken under the special protection of the family of the Cæsars. Many celebrities have been supposed to owe their lives to the operation; among the rest Æsculapius, Julius Cæsar, and our own Edward VI. Regarding the two latter, there is conclusive proof that the tradition is without foundation.

Was often enforced by law after the death of the mother.

There is no doubt that the operation was constantly practised on women who had died at an advanced period of pregnancy, and indeed it has, at various times, been enforced by law. Thus, among the Romans, it was decreed by Numa that no pregnant woman should be buried until the fœtus had been removed by abdominal section. The Italian laws also made it necessary, and the operation has always received the strong support of the Roman Church. So lately as the middle of the eighteenth century, the King of Sicily sentenced to death a physician who had neglected to practise it. The first authentic case in which the operation was performed on a living woman occurred in 1491. It was afterwards prac-

tised by Nufer in 1500 ; and in 1581 Rousset published a work on the subject, in which a number of successful cases were related. In English works of that time it is not alluded to, although it was undoubtedly performed on the Continent and to such an extent that its abuse became almost proverbial. We have evidence in Shakespeare, however, that the operation was familiarly known in this country, since he tells us that—

> . . . Macduff was from his mother's womb
> Untimely ripped.

Paré and Guillemeau, amongst the writers of the period, were noted for their hostility to the operation, while others equally strongly upheld it.

In this country it has scarcely ever been performed in a manner which offers even the faintest hope of success. It has been looked upon as almost necessarily fatal to the mother, and it has, therefore, been delayed until the patient has arrived at the utmost stage of exhaustion. For example, in looking over the records of British cases, it is no uncommon thing to find that the Cæsarean section was resorted to, two, three, or even six days after labour had begun, and when the patient was almost moribund. With rare exceptions within the last few years, the operation has been performed in what may be called a haphazard way. In many cases long and fruitless attempts at delivery by craniotomy had already been made, so that the passages had been subjected to much contusion and violence. Little or no attempt has been made to obviate the well-known risks of abdominal operations ; no care has been taken to prevent blood and other fluids finding their way into the peritoneal cavity, and no means have been adopted subsequently to remove them. It is, therefore, not so much a matter of surprise that the mortality has been so great, but rather that any cases have recovered.

In this country the Cæsarean section has always been performed under the most unfavourable conditions.

It has also been done without proper care and attention to details.

From what we know of the history of ovariotomy, its early fatality, and the extreme and even apparently exaggerated precautions which are essential to its success, it is fair to conclude that, if the Cæsarean section were performed, as it is to be hoped it always will be in future, with the same careful attention to minute details as ovariotomy, the results would not be so disastrous. Making every allowance for

The mortality attending it is therefore not surprising.

these facts, it must be admitted that the Cæsarean section is necessarily almost a forlorn hope ; and in making these observations I have no intention of contesting the well-established rule of British practice that it is not admissible as an operation of election, and must only be resorted to when delivery *per vias naturales* is impossible.

Statistical returns are not reliable.

The mortality, as given in statistical returns from various sources, differs so greatly as to make them but little reliable. Radford has tabulated the operations performed in this country up to 1868, and the list has been completed by Harris[1] up to 1879. The cases amount to 138 in all, of which 26 were successful. Michaelis and Kayser found that out of 258 cases and 338 operations, 54 and 64 per cent. respectively were fatal. These include operations performed under all sorts of conditions, even when the patient was almost moribund ; and until we are in possession of a sufficient number of cases performed under conditions showing that the result is certainly due to the operation—in which it was undertaken at an early period of labour and performed with a reasonable amount of care—it is obviously impossible to arrive at any reliable conclusions as to the mortality of the operation.

In some cases it has been successfully performed more than once on the same patient.

That it is necessarily hopeless is certainly not the case, and we know that on the Continent, where it is resorted to much oftener and earlier in labour than in this country, there are authentic cases in which it has been performed twice, thrice, and even, in one instance, four times on the same patient. Kayser thinks that a second operation on the same patient affords a better prognosis than a first, probably because peritoneal adhesions, resulting from the first operation, have shut off the general abdominal cavity from the uterine wound ; and he believes that in second operations the mortality is not more than 29 per cent.

The Cæsarean section in America.

The Cæsarean section has been much more successful in America than in Great Britain. Dr. Harris, of Philadelphia, who has paid much attention to the subject, has collected 134 cases occurring in the United States, of which 53, or about 40 per cent., were successful as regards the mother. These favourable results he refers, partly to the fact that none of the American cases were the subjects of mollities ossium, rachitic patients forming one

[1] 'The Cæsarean Operation in the United Kingdom,' *Brit. Med. Journ.* April 3, 1880.

half of the entire number, partly to the prevalence of habits of beer- and gin-drinking in this country. He also gives some interesting facts showing how remarkably the mortality of the operation is lessened when it is performed soon, and the patient is not exhausted by long and fruitless labour. Out of 27 selected cases of this kind 20, or $74\frac{2}{27}$ per cent. were successful.

The mortality of the children likewise cannot be ascertained from statistical returns, since, in the large majority of cases in which dead children were extracted, the result had nothing to do with the operation. Indeed, there is nothing in the operation itself which can reasonably be supposed to affect the child. If, therefore, the child be alive when the operation is commenced, there is every probability of its being extracted alive ; and Radford's conclusion, that ' the risk to infants in Cæsarean births is not much greater than that which is contingent on natural labour, provided correct principles of practice are adopted,' probably very nearly represents the truth. *Results to the child.*

The Cæsarean section is required when there is such defective proportion between the child and the maternal passages that even a mutilated fœtus cannot be extracted. This in by far the greatest number of cases is due to deformity of the pelvis arising from rickets or mollities ossium. The latter may occur in a patient who has been previously healthy, and who has given birth to living children. It is a more common cause of the extreme varieties of deformity than rickets ; and out of 77 British cases tabulated by Radford, in 43 the deformity was produced by osteomalacia and in 14 only by rickets. In certain cases the pelvis itself may be of normal size, but has its cavity obstructed by a solid tumour of the ovary, of the uterus itself, or one growing from the pelvic wall. The obstruction may also depend on morbid conditions of the maternal soft parts, of which the most common is advanced malignant disease of the cervix. Other conditions may, however, render the operation essential. Thus Dr. Newman [1] records a case in which he performed it for insurmountable resistance and obstruction of the cervix, which was believed at the time to be caused by *Causes requiring the operation. Of these the most common is pelvic deformity. Tumours obstructing the pelvis, or morbid conditions of the maternal soft parts.*

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[1] *Obst. Trans.* vol. vii. p. 343.

malignant disease. The patient recovered, and was subsequently delivered naturally, and without anything abnormal being made out. This renders it probable that the disease was not malignant, and it may possibly have been an extensive inflammatory exudation into the tissues of the cervix, subsequently absorbed. I myself was present at a Cæsarean section performed in Calcutta in the year 1857, when the pelvis was so uniformly blocked up with exudation, probably due to extensive pelvic cellulitis or hæmatocele, that the operation was essential.

Limits of obstruction justifying the operation.

Different accoucheurs have fixed on various limits for the operation. Most British authorities are of opinion that it need not be resorted to if the smallest diameter of the pelvis exceed $1\frac{1}{2}$ inch.[1] This question has already been considered in discussing craniotomy, and it has been shown that a mutilated fœtus may be drawn through a pelvis of $1\frac{1}{2}$ inch antero-posterior diameter, provided there be a space of 3 inches in the transverse diameter. If sufficient space for using the necessary instruments do not exist the Cæsarean section may be required, even when there is a larger antero-posterior diameter than $1\frac{1}{2}$ inch. This is especially likely to occur when we have to do with deformity arising from mollities ossium, in which the obstruction is in the sides and outlet of the pelvis, the true conjugate being sometimes even elongated. On the Continent the Cæsarean section is constantly practised, as an operation of election, when the smallest diameter measures from 2 to $2\frac{1}{2}$ inches; and when the child is known to be alive, some foreign authors recommend it when there are as much as 3 inches in the antero-posterior diameter. In this country, where the life of the child is most properly considered of secondary importance to the safety of the mother, we cannot fix one limit for the operation when the child is living, and another when it is dead. Nor, I think, can we admit the desire of the mother to run the risk, rather than sacrifice the child, as a justification of the operation, although this is laid down as an indication by Schroeder.[2] Great as are the dangers attending craniotomy in extreme deformity, there can be no doubt that

On the Continent the Cæsarean section is often performed in lesser degrees of deformity.

Cæsarean section not justifiable as an operation of election.

Craniotomy must

[1] In Dr. Parry's table of 70 craniotomies, there are 34 cases of 2 to $2\frac{1}{2}$ inches coujugate.

[2] *Manual of Midwifery*, p. 202.

we must perform it whenever it is practicable, and only
resort to the Cæsarean section when no other means of
delivery are possible.

be per-
formed
whenever
delivery
by that
means is
possible.

For this reason I think it unnecessary to discuss the
question whether we are justified in destroying the foetus
in several successive pregnancies, when the mother knows
that it is impossible for her to give birth to a living child.
Denman was the first to question the advisability of repeat-
ing craniotomy on the same patient. Amongst modern
authors Radford takes the most decided view on this point,
and distinctly teaches that even when delivery by cranio-
tomy is possible, it ' can be justified on no principle, and is
only sanctioned by the dogma of the schools, or by usage,'
and that, therefore, the Cæsarean section should be per-
formed with the view of saving the child. Doubtless much
can be said from this point of view; but, nevertheless,
he would be a bold man who would deliberately elect to
perform the Cæsarean section on such grounds.[1] It is to be
hoped, however, that in these days the induction of prema-
ture labour or abortion would always spare us the necessity
of deciding so delicate a point.

The Cæsarean section may also be required in cases in
which death has occurred during pregnancy or labour. This
was the indication for which it was first employed, and it has
constantly been performed when a pregnant woman has died
at an advanced period of utero-gestation. There is no doubt
that a prompt extraction of the child under these circum-
stances has frequently been the means of saving its life,
but by no means so often as is generally supposed. Thus
Schwartz[2] showed that out of 107 cases not one living child
was extracted. Duer[3] has written an interesting paper on
this subject, in which he has tabulated 55 cases of post-
mortem Cæsarean sections. In 40 a *living* child was ex-
tracted, the time elapsing after the death of the mother

[1] This was done twice successfully by Prof. William Gibson in the case of
Mrs. Reybold, of Philadelphia, in 1835 and 1837, after she had twice been
delivered by craniotomy under Prof. Charles D. Meigs, who declined destroy-
ing any more children for her. Mrs. R. still lives at the age of seventy, and
the daughter and son likewise, with their six children.—Harris's note to
third American edition.

[2] *Monat. f. Geburt.* suppl. vol. 1861, p. 121.

[3] Post-mortem Delivery, *Am. Journ. of Obst.* Jan. 1879.

being as follows : ' Between 1 and 5 minutes, including "immediately," and "in a few minutes," there were 21 cases ; between 5 and 10 minutes, none ; between 10 and 15 minutes, 13 cases ; between 15 and 23 minutes, 2 cases ; after 1 hour 2 cases ; and after two hours, 2 cases.' In those extracted, however, after the lapse of an hour, the children did not ultimately survive, and the cases themselves seem open to some doubt.

Want of success in post-mortem operation.   The reason that the want of success has been so great is doubtless the delay that must necessarily occur before the operation is resorted to, for independently of the fact that the practitioner is seldom at hand at the moment of death, the very time necessary to assure ourselves that life is actually extinct will generally be sufficient to cause the death of the fœtus. Considering the intimate relations between the mother and child, we can scarcely expect vitality to remain in the latter more than a quarter, or at the outside, half an hour, after it has ceased in the former. The recorded instances in which a living child was extracted ten, twelve, and even forty hours after death, were most probably cases in which the mother fell into a prolonged trance or swoon, during the continuance of which the child must have been removed. A few authentic cases, however, are known in which there can be no reasonable doubt that the operation was performed successfully several hours after the mother was actually dead.

We are, however, bound to perform it when an opportunity arises.   Since, then, there is a chance, however slight, of saving the child's life, we are bound to perform the operation, even when so much time has elapsed as to render the chances of success extremely small. It might be considered almost superfluous to insist on the necessity of assuring ourselves of the mother's death before commencing the necessary in-

Necessity of care in the operation. cisions ; but, unfortunately, numerous instances are known in which mistakes in diagnosis have been made, and in which the first steps of the operation have shown that the mother was still alive. The operation should, therefore, always be performed with the same care and caution as if the mother

Delivery by turning after the death of the mother. were living. If death have occurred during labour, some have advised version as a preferable alternative. This can only be resorted to, with any hope of success, if the passages be in a condition to admit of delivery with rapidity ; other-

wise the delay occasioned by dilatation, even when forcibly accomplished, and the drawing of the child through the pelvis, will be almost necessarily fatal. The only argument in favour of version is, that it is less painful to the friends; and, if they manifest a decided objection to the Cæsarean section, there can be no reason why an attempt to save the child in this way should not be made.

The causes of death after the Cæsarean section may, speaking generally, be classed under four principal heads : hæmorrhage, peritonitis, and metritis, shock, septicæmia, and exhaustion from long delay. These are pretty much the same as those following ovariotomy, and the resemblance between the two operations is so great that modern experience as to the best mode of performing ovariotomy, as well as regards the after-treatment, may be taken as a guide in the management of cases of Cæsarean section. *Causes of death after Cæsarean section.*

Hæmorrhage to an alarming extent is a frequent complication, though seldom the cause of death. Thus out of 88 operations, the particulars of which have been carefully noted, severe hæmorrhage occurred in 14, 6 of which terminated successfully, and in 4 only could the fatal result be ascribed to the loss of blood. In 1 of these the source of the hæmorrhage is not mentioned, in another it came from the wound in the abdominal wall, and in the other 2 from the uterine incision being made directly over the placenta. In neither of the 2 latter was the loss of blood immediately fatal; for it was checked by uterine contraction, and only recurred after many hours had elapsed. The divided uterine sinuses, and the open mouths of the vessels at the placental site, are the most common sources of hæmorrhage. *Hæmorrhage is frequent, although seldom fatal.*

Much may be done to diminish the risk of bleeding, but even with every precaution it must be a source of danger. Hæmorrhage from the abdominal wall may be best prevented by making the incision as nearly as possible in the line of the linea alba, so as not to wound the epigastric arteries, and by controlling bleeding by pressure forceps as we proceed, as is done in ovariotomy. The principal loss of blood will be met with in dividing the uterus; and this will be the greatest when the incision is near or over the placental site, where the largest vessels are met with. We are recommended to ascertain the position of the placenta by *Means of avoiding the risk.*

auscultation, and thus, if possible, to avoid opening the uterus near its insertion. But even if we admit the placental souffle to be a guide to its situation, if the placenta be attached to the anterior walls of the uterus, a knowledge of its position would not always enable us to avoid opening the uterus in its immediate vicinity. We must, in the event of its lying under the incision, rather hope to control the hæmorrhage by removing it at once from its attachments, and rapidly emptying the uterus. When the child has been removed there may be a large escape of blood; but this will generally be stopped by the contraction of the uterus, in the same manner as after natural labour. Should contraction not take place, the uterus may be firmly grasped for the purpose of exciting it. This plan is advocated by Winckel, who had a large experience in the operation; and by using free compression in this way, and making a point of not closing the wound until the uterus is firmly contracted, he has never met with any inconvenience from hæmorrhage. If bleeding continue, styptic applications may be used, as in a case reported by Hicks, who was obliged to swab out the uterine cavity with a solution of perchloride of iron.

Peritonitis and metritis are frequent causes of death.

Among the most frequent causes of death are peritonitis and metritis. Kayser attributes the fatal results to them in 77 out of 123 unsuccessful cases.

The mere division of the peritoneum will not account for the frequency of this complication, since its occurrence is considerably more frequent than after ovariotomy, in which the injury to the peritoneum is quite as great, and indeed greater, if we take into account the adhesions which have to be divided or torn in that operation.

The division of the uterus must be regarded as one source of this danger. Dr. West lays great stress on its unfavourable condition after delivery for reparative action. He believes that the process of involution or fatty degeneration which commences in the muscular fibres previous to delivery, renders them peculiarly unfitted to cicatrize; and he points out that, on post-mortem examination, the edges of the incision have been found dry, of unhealthy colour, gaping, and showing no tendency to heal. On this account Hicks and others have operated ten days or more before the full period of labour, in the hope that the risk from this source

Degeneration of the uterine fibres supposed to be unfavourable to repair. On this account some have operated before the

might be avoided. It is by no means certain, however, that full term of pregnancy. the change in the uterine fibres is the cause of the wound not healing, and involution will commence at once when the uterus is emptied, even if the full period of pregnancy have not arrived. As a point of ethics, moreover, it is question- Objections to this plan. able if we are justified in anticipating the date of so dangerous an operation, even by a few weeks, unless the benefit to be derived is very decided indeed.

One important cause of peritonitis is the escape of the Escape of lochia and other fluids into the perito-neal cavity. lochia through the uterine incision into the cavity of the peritoneum, which there decompose and act as an unfailing source of irritation. This may be prevented, to a great extent, by seeing that the os uteri is patulous, so as to afford a channel for the escape of discharges, and by closing the uterine wound by sutures. In addition there is the danger arising from blood and liquor amnii escaping into the peritoneum, and subsequently decomposing. There is little evidence that 'la toilette du péritoine,' on which ovarioto-mists now lay so much stress, has ever been particularly attended to in Cæsarean operations.

The chief predisposing cause of these inflammations, The un-healthy condition of the patient is the chief source of danger. however, must be looked for in the condition of the patient, just as asthenic inflammation in ovariotomy is most fre-quently met with in those whose general health is broken down by the long continuance of the disease. We are fully justified, therefore, in assuming that peritonitis and metritis will be more likely to occur after the Cæsarean section when that operation has been unnecessarily delayed, and when the patient is exhausted by a protracted labour. In proof of this we find that, in a large proportion of the cases above mentioned, peritonitis occurred when the operation was per-formed under unfavourable conditions.

The sources of septicæmia are abundantly evident, not Septicæ-mia. the least, probably, being absorption by the open vessels in the uterine incision.

The last great danger is general shock to the nervous Nervous shock. system. In Kayser's 123 cases, 30 of the deaths are referred to this cause. In the large majority of these the patient was profoundly exhausted before the operation was begun. It is in predisposing to these nervous complications that we should, à priori, expect that vacillation and delay would be

most hurtful; and in operating when the patient's strength is still unimpaired, we afford her the best chance of bearing the inevitable shock of an operation of such magnitude.

Secondary dangers.

In addition a few cases have been lost from accidental complications, which are liable to occur after any serious operation, and which do not necessarily depend on the nature of the procedure.

Danger to child from portions of its body being caught by the contracting uterus.

There is only one source of danger special to the child which is worthy of attention. As the infant is being removed from the cavity of the uterus, the muscular parietes sometimes contract with great rapidity and force, so as to seize and retain some part of its body. This occurred in two of Dr. Radford's cases, and in one of them it is stated that ' the child was vigorously alive when first taken hold of, but, from the length of time occupied in extracting the head, it became so enfeebled as to show only slight signs of life,' and subsequently all attempts at resuscitation failed. I have myself seen the head caught in this way, and so forcibly retained that a second incision was required to release it. In

Cause of the accident.

Dr. Radford's cases the placenta happened to be immediately under the incision, and he attributes the inordinate and rapid contraction of the uterus to its premature separation. It is difficult to believe that this was more than a coincidence, because the contraction does not take place until the greater part of the child's body has been withdrawn, and because numerous cases are recorded in which the uterus was opened directly over the placenta, or in which it was lying loose and detached, in none of which this accident occurred. The true explanation may, I think, be found in the varying irritability of the uterus in different cases.

Irrespective of the risk of portions of the child being caught and detained, rapid contraction is a distinct advantage, since the danger of hæmorrhage is thereby thus dimi-

Mode of avoiding it.

nished. Serious consequences may be best avoided by removing, when practicable, the head and shoulders of the child first, or by employing both hands in extraction, one being placed near the head, the other seizing the feet. Either of these methods is preferable to the common practice of laying hold of the part that may chance to lie most conveniently near the line of incision. If this point were properly attended

to, although the detention of the lower extremities might occasionally occur, the life of the child would not be imperilled.

The preparation of the patient for the operation should seriously occupy the attention of the practitioner, and this is the more essential since almost all patients requiring the Cæsarean section are in a wretchedly debilitated condition. If the patient be not seen until she is actually in labour, of course this is out of the question. But this will rarely be the case, since the deformed condition of the patient must generally have attracted attention. Every possible means should be taken, therefore, when practicable, to improve the general health by abundance of simple and nourishing diet, plenty of fresh air, and suitable tonics (amongst which preparations of iron should occupy a prominent place), while the state of the secretions, the bowels, skin, and kidneys, should be specially attended to. Whenever it is possible a large, airy apartment should be selected for the operation, which should never be done in a hospital, if other arrangements be practicable. These details may seem trivial and unnecessary; but to insure success in so hazardous an undertaking no care can be considered superfluous, and probably the want of attention to such points has had much to do with increasing the mortality.

The question arises whether we should operate before labour has commenced. By selecting our own time, as some have advised, we certainly have the advantage of operating under the most favourable conditions, instead of possibly hurriedly. There are, however, numerous advantages in waiting until spontaneous uterine action has commenced, which seem to me to more than counterbalance the advantages of choosing our own time. Prominent among these is the partial opening of the os uteri, so as to afford a channel for the escape of the lochia, and the certainty of active contraction of the uterus, to arrest hæmorrhage. Barnes recommends that premature labour should be first induced, and then the operation performed. This seems to me to introduce a needless element of complexity; and besides, in cases of great deformity, it is by no means always easy to reach the cervix with the view of bringing on labour. All needful arrangements should be made, so as to avoid hurry

and excitement when the operation is commenced, and we may then wait patiently until labour has fairly set in.

The adminis-tration of anæsthe-tics. The operation itself is simple. The patient should be placed on a table, in a good light, and with the temperature of the room raised to about 65°. Chloroform has so frequently been followed by severe vomiting, that it is probably better not to administer it. For the same reason Mr. Spencer Wells has long given up using it in ovariotomy, and finds that chloro-methyl answers admirably; ether also is devoid of the disadvantages of chloroform. In one or two cases local anæs-thesia has been used, by means of two spray producers acting simultaneuosly; and this plan, if the patient have sufficient fortitude to dispense with general anæsthesia, has the further advantage of stimulating the uterus to powerful contraction.

To insure as great a measure of success as possible the operation should be performed with all the minute precautions used in ovariotomy.

Descrip-tion of the operation. The incision should be made as much as possible in the line of the linea alba, so as to avoid wounding the epigastric arteries. On account of the deformity, the configuration of the abdomen is often much altered, and some have advised that the incision should be made oblique or transverse, and on the most prominent part of the abdomen. The risk of hæmorrhage being thus much increased, the practice is not to be recommended. The incision, commencing a little above the umbilicus, is carried down for about three inches below it. The skin and muscular fibres are carefully divided, layer by layer, until the shining surface of the peritoneum is reached, and any bleeding vessels should be secured as we proceed. A small opening is now made in the peritoneum, which should be laid open along the whole length of the incision, upon two fingers of the left hand introduced as a guide. Before incising the uterus an assistant should care-fully support it in a proper position, and push it forward by the hands placed on either side of the incision, so as to bring its surface into apposition with the external wound, and prevent the escape of the intestines. If we have reason to believe that the placenta is situated anteriorly, we may incise the uterus on one or other side; otherwise the line of incision should be as nearly as possible central. The sub-stance of the uterus is next divided until the membranes are

reached, which are punctured, and divided in the same way as the peritoneum. The uterine incision should be of the same length as that in the abdomen, and it should not be made too near the fundus; for not only is that part more vascular than the body of the uterus, but wounds in that situation are more apt to gape, and do not cicatrize so favourably. After the uterus is opened, Dr. Winckel recommends that the fingers of an assistant should be placed in the two terminal angles of the wound, so that the ends of the incision may be hooked up, and brought into close apposition with the abdominal opening. By this means he prevents not only the escape of blood and liquor amnii into the cavity of the peritoneum, but also the protrusion of the abdominal viscera.

The child should now be carefully removed, the head and shoulders being taken out (if possible) first; the placenta and membranes are afterwards extracted. Should the placenta be unfortunately found immediately under the incision, a considerable loss of blood is likely to take place, which can only be checked by removing it from its attachments, and concluding the operation as rapidly as possible. *Removal of the child.*

As soon as the child and the secundines have been extracted, the sooner the uterus contracts the better. It will usually do so of itself, but should it remain lax and flabby, it should be pressed and stimulated by the hand. We are specially warned against handling the uterus by Ramsbotham and others; but there seems no valid reason why we should not restrain hæmorrhage in this way, as after a natural labour. The intervention of the abdominal parietes, in their lax condition after delivery, can make very little difference between the two cases. Ergotine administered hypodermically will also be useful in promoting efficient contraction. *Importance of securing uterine contraction.*

The advisability of closing the uterine wound by sutures is a mooted point. The balance of evidence is certainly in favour of this practice, as tending to prevent the escape of the lochia into the peritoneal cavity. Interrupted sutures of silver wire may be used, and cut short; or, as successfully practised by Spencer Wells, a continuous silk suture may be applied, one end being passed through the os into the vagina, by which it is subsequently withdrawn. Sutures of ordinary catgut are apt to yield, and are, therefore, unreliable; but *Closure of the uterine and abdominal wounds.*

chromic gut, or some of the antiseptic guts now prepared, may doubtless be used with safety. Before closing the uterine wound one or two fingers should be passed through the cervix, to insure its being patulous. A free escape of the lochia in this direction is of great consequence, and Winckel even advises the placing of a strip of lint, soaked in oil, in the os so as to keep up a free exit for the discharge.

The abdominal wound should not be closed until hæmorrhage has ceased.

A point of great importance, and not sufficiently insisted on, is the advisability of not closing the abdominal wound until we are thoroughly satisfied that hæmorrhage is completely stopped, since any escape of blood into the peritoneum would very materially lessen the chances of recovery. In a successful case reported by Dr. Newman,[1] the wound was not closed for nearly an hour. Before doing so all blood and discharges should be carefully removed from the peritoneal cavity, by clean soft sponges dipped in warm water. The abdominal wound should be closed from above downwards, by harelip pins, wire or silk sutures, which should be inserted at a distance of an inch from each other, and passed entirely through the abdominal walls and the peritoneum, at some little distance from the edges of the incision, so as to bring the two surfaces of the peritoneum into contact. By this means we insure the closure of the peritoneal cavity, the opposed surfaces adhering with great rapidity. If, as should be the case, the operation is performed with full antiseptic precautions, the wound should now be dressed precisely as after ovariotomy.

Subsequent management.

Into the subsequent treatment it is unnecessary to enter at any length, since it must be regulated by general principles, each symptom being met as it arises. It has been customary to administer opiates freely after the operation ; but they seem to have a tendency to produce sickness and vomiting, and ought not to be exhibited unless pain or peritonitis indicate that they are required. In fact, the treatment should in no way differ from that usual after ovariotomy, and the principles that should guide us will be best shown by the following quotation from Mr. Spencer Wells's description of that operation : ' The principles of after-treatment are—to obtain extreme quiet, comfortable warmth, and perfectly clean linen to the patient; to relieve pain by warm

[1] *Obst. Trans.* vol. viii.

applications to the abdomen, and by opiate enemas; to give stimulants when they are called for by failing pulse or other signs of exhaustion; to relieve sickness by ice, or iced drinks; and to allow plain, simple, but nourishing food. The catheter must be used every six or eight hours, until the patient can move without pain. The sutures are removed on the third day, unless tympanitic distension of the stomach or intestines endanger reopening of the wound. In such circumstances they may be left for some days longer. The superficial sutures may remain until union seems quite firm.'

Within the last few years an important modification of the Cæsarean section has been adopted, which is generally known as Porro's operation, from Professor Porro, of Pavia, who was the first European surgeon who practised it. In this operation, after the uterus is emptied, the entire organ is drawn out of the abdominal wound and excised, its neck being first constricted so as to suppress hæmorrhage, the stump being fixed externally in the manner of the pedicle in ovariotomy. The idea is by no means new. It appears to have been first suggested by an Italian—Dr. Cavallini— in 1768. In 1823, the late Dr. Blundell made the same proposal, and fortified it by numerous experiments on pregnant rabbits, in the course of which he found that he lost all by the Cæsarean section but saved three out of four in which he ligatured and amputated the uterus. The suggestion was not, however, carried into actual practice until Dr. Storer, of Boston, in 1869, removed the uterus in a case of fibroid tumour obstructing the pelvis and impeding delivery.

Since Porro's first case, the operation has been frequently performed on the Continent, with results which are, on the whole, encouraging. The cases have been carefully tabulated by Dr. Harris, of Philadelphia, and more recently, and very completely, by Dr. Clement Godson,[1] who has collected 170 [2] cases, out of which 75, or 44·1 per cent., were successful as regards the mother. This result is certainly superior to those following the Cæsarean section as ordinarily performed. The obvious advantage of this plan is, that instead of leaving the incised uterus with its probably gaping wound and all

Porro's operation.

Its history.

[1] 'Porro's Operation,' *Brit. Med. Journ.* Jan. 26, 1884.
[2] Dr. Godson has kindly made up these figures for me up to the present date (June 1886).

the attendant risk of septic mischief, in the abdominal cavity, it is fixed externally, and in a position where it can be readily dressed.

The objection is that it entirely unsexes the patient; but in the class of women requiring the Cæsarean section from pelvic deformity, it is questionable whether this can be fairly considered as a drawback. It is perhaps not justifiable to attempt as yet any positive decision as to the indications for this plan, but it seems beyond doubt that the risks are considerably less than those of the Cæsarean section. The

The operation.

operation in the successful cases has been performed under the carbolic spray, and the neck of the uterus, after the organ is emptied, carefully secured by ligatures, before its body is amputated. Some operators have encircled the neck of the uterus with a chain or wire écraseur before removing it, and by this means completely controlled hæmorrhage. Richardson [1], transfixed the neck of the uterus with two large pins crossing each other, before removing the wire of the écraseur, and encircled them with stout carbolised cord. Müller, of Berne, has recommended that the entire uterus should be turned out of the abdominal cavity through a long incision, before it is emptied, so as to avoid the risk of its fluid contents entering the abdomen; but this manœuvre has not always proved feasible. The pedicle has generally been fixed in the lower angle of the abdominal wound and dressed antiseptically. In most cases one or more drainage-tubes have been used, either through Douglas's space, or in the abdominal wound.

Substitute for the Cæsarean section : symphyseotomy.

Bearing in mind the great mortality attending the Cæsarean section, it is not surprising that obstetricians should have anxiously considered the possibility of devising a substitute, which should afford the mother a better chance of recovery. The first proposal of the kind was one from which great results were at first anticipated. In 1768 Sigault, then a student of medicine in Paris, suggested *symphyseotomy*, which consists in the division of the symphysis pubis, with a view of allowing the pubic bones to separate sufficiently to admit of the passage of the child. Although at first strongly opposed, it was subsequently ardently advocated by many obstetricians, and was often

[1] *American Journ. of Med. Science*, July 1881.

performed on the Continent, and in a few cases in this country.

It is generally admitted that it is quite impossible to make this a substitute for the Cæsarean section, since the utmost gain which even a wide separation of the symphysis pubis would give would be altogether insufficient to admit of the passage of even a mutilated fœtus. Dr. Churchill concludes that, even if it were possible to separate it to the extent of four inches, we should only have an increase of from four lines to half an inch in the antero-posterior diameter, in which the obstruction is generally most marked. In the lesser degrees of deformity this might possibly be sufficient to allow the fœtus to pass; but the risk of the operation itself, and the subsequent ill-effects, altogether contra-indicate it in cases of this description.

The operation is admitted to be useless.

CHAPTER VII.

LAPARO-ELYTROTOMY.

Laparo-
elytro-
tomy.

IN the former editions of this work laparo-elytrotomy was briefly considered as one of the suggested substitutes for the Cæsarean section which merited careful study, and appeared to be of a promising character, but of which too little was known to justify any positive conclusions with regard to it. The subject naturally attracted considerable attention, and several interesting papers have appeared in which its indications, difficulties, and advantages have been carefully considered. Since Thomas's first case was published, several operations have been performed, with results so encouraging that I cannot but believe that the operation has a great future before it, and that it will be the duty of the accoucheur to resort to it instead of the more hazardous Cæsarean section, unless some special contra-indication exists. Under these circumstances it seems proper no longer to consider it as an addendum to the description of the Cæsarean section, but to study it more in detail in a separate chapter.

History.

The history of the operation is curious and interesting. The earliest suggestion of a procedure of this character seems to have been made by Joerg in the year 1806, who proposed a modified Cæsarean section, without incision of the uterus, by the division of the linea alba, and of the upper part of the vagina, the foetus being extracted through the cervix. This suggestion was never carried into practice, and it is obvious that it misses the one chief advantage of laparo-elytrotomy, the leaving of the peritoneum intact. In 1820 Ritgen proposed, and actually attempted, an operation much resembling Thomas's, in which section of the peritoneum was avoided. He failed, however, to complete it, and was eventually compelled to deliver his patient by the

Cæsarean section. In 1823 Baudelocque, the younger, independently conceived the same idea, and actually carried it into practice, although without success. Lastly, in 1837, Sir Charles Bell suggested a similar operation, clearly perceiving its advantages. Hence it appears that previous to Thomas's recent work in the matter, the operation was independently invented no less than three times. It fell, however, entirely into oblivion, and was only occasionally mentioned in systematic works as a matter of curious obstetric history, no one apparently appreciating the promising character of the procedure.

In the year 1870, Dr. T. Gaillard Thomas, of New York, read a paper before the Medical Association of the town of Yonkers, on the Hudson River, entitled 'Gastro-elytrotomy, a substitute for the Cæsarean section,' in which he described the operation as he had performed it three times on the dead subject, and once on a married woman in 1870, with a successful issue as regards the child. It seems beyond doubt that Thomas invented the operation for himself, being ignorant of Ritgen's and Baudelocque's previous attempts, and it is certain, to quote Garrigues,[1] that to him 'belongs the glory of having been the first who performed gastro-elytrotomy so as to extract a living child from a living mother in his first operation, and of having brought both mother and child to complete recovery in his second operation.'

Since Thomas's first case, the operation has been performed three times by Dr. Skene, of Brooklyn, and has found its way across the Atlantic, having been twice performed in England, by Himes in Sheffield, and by Edis in London.

The object of laparo-elytrotomy is to reach the cervix by incision through the lower part of the abdominal wall, and upper part of the vagina, and through it to extract the fœtus as may most easily be done. *Nature of the operation.*

If this procedure is found practicable, the enormous advantages it offers over the Cæsarean section are at once apparent, since in dividing the abdomen the abdominal wall only is incised, and the peritoneum is left intact. The vagina is divided, but incision of the uterine parietes, which forms one of the chief risks of the Cæsarean section, is entirely *Advantages over the Cæsarean section.*

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[1] *New York Med. Journ.* Nov. 1878.

avoided.   Now there is nothing in either of these procedures alarming in itself, and if further experience proves that the practical difficulties of the operation do not stand in the way of its adoption, Dr. Thomas will have introduced, by his able advocacy of the operation, probably the greatest improvement in modern obstetrics.

Cases suitable for the operation.

It may be broadly stated that laparo-elytrotomy is applicable in all cases calling for the Cæsarean section, when the mother is alive.   In post-mortem extractions of the fœtus, the Cæsarean section, being the most rapid procedure, would certainly be preferable.   Exceptions must be made for certain cases of morbid conditions of the soft parts which render delivery *per vias naturales* impossible, and in which laparo-elytrotomy could not be performed, as in cases of tumour obstructing the pelvic cavity, also in carcinoma or fibroid of the uterus.   When the head is firmly impacted in the pelvic orim, and cannot be dislodged, the operation would be impossible, as the vagina could not be incised. Unlike the Cæsarean section, the operation cannot be performed twice on the same patient, at least on the same side, since adhesions left by the former incisions would prevent the separation of the peritoneum and division of the vagina. It remains to be seen whether in certain cases of extreme deformity, with pendulous abdomen and distorted thighs, the site of incision might not be so difficult to reach as to render the necessary manœuvres impossible.

Anatomy of the parts concerned in the operation.

It will facilitate the proper comprehension of the operation, and render an avoidance of its possible dangers more easy, if the anatomical relations of the parts concerned are briefly described.

Abdominal incision.

The abdominal incision extends from a point an inch above the anterior superior iliac spine, and is carried, with a slight downward curve, parallel to Poupart's ligament, until it reaches a point one inch and three-quarters above, and to the outside of, the spine of the pubes.   Beyond the latter point it must not extend, so as to avoid the risk of wounding the round ligament and the epigastric artery.   In this incision the skin, the aponeurosis of the external oblique, and the fibres of the internal oblique, and transversalis muscles, are divided.   The rectus is not implicated.   After the muscles are divided, the transversalis fascia is reached.   It

is fortunately rather dense in. this situation, and is separated
from the peritoneum by a layer of connective tissue contain-
ing fat.

The superficial epigastric artery is necessarily divided, Arteries.
but is too small to give any trouble. The internal epigastric
is fortunately not divided, but is so near the inner end of
the incision that it may accidentally be so. In one of Dr.
Skene's operations it was laid bare. Starting from the
external iliac, about a quarter of an inch above Poupart's
ligament, it runs downwards, forwards, and inwards to the
ligament, thence it turns upwards and inwards, in front of
the round ligament and to the inner side of the internal
abdominal ring, behind the posterior layer of the sheath of
the rectus muscle, which it finally enters. The circumflex
iliac artery also rises from the external iliac a little below the
epigastric. It runs between the peritoneum and Poupart's
ligament until it reaches the crest of the ilium, to the inner
side of which it runs. It thus lies altogether below the line
of the incision, and is not likely to be injured.

After the transversalis fascia is divided, the peritoneum Perito-
is reached, and is readily lifted up intact, so as to expose neum.
the upper part of the vagina, through which the fœtus is ex-
tracted. It is fortunate, as facilitating this manœuvre, that
the peritoneum is much more lax than in the non-pregnant
state, and it has been found very easy to lift it out of the
way in all the operations hitherto performed.

The division of the vagina is the part of the operation Vaginal
likely to give rise to most trouble and risk. It is to be noted incision.
that, in cases of pelvic contraction calling for this operation,
the uterus, with its contents, will be abnormally high and
altogether above the pelvic brim; the vagina is, therefore,
necessarily elongated and brought more readily within reach.
It is enlarged in its upper part during pregnancy, and thrown
into folds ready for dilatation during the passage of the child.
It is loosely surrounded by the other tissues, and is composed
of muscular fibres, easily separable, and an internal mucous
layer. Its vascular arrangements are very complex, and the
risk of hæmorrhage is one of the prominent difficulties of
the operation.

In Baudelocque's attempt, in which the vagina was cut
instead of torn, the loss of blood was so great as to lead to a

discontinuance of the operation. The arteries are numerous, consisting of branches from the hypogastric, inferior vesical, internal pudic, and hæmorrhoidal. The veins form a network surrounding the whole canal, but are largest at its extremities, so that it is desirable to open the vagina as low down as possible.

Relations of the vagina.

Behind the vagina lies the pouch of peritoneum known as Douglas's space, and below that the rectum. In front of it lies the bladder, and the risk of injuring that viscus, or the ureter entering it, constitutes another of the dangers of the operation. The relations of these parts have been specially studied by Garrigues,[1] with the view of facilitating the safe performance of the operation, and I quote his description.

'The anterior superior surface of the vagina is, in its upper part, bound by loose connective tissue to the *bladder* on a surface that has the shape of a heart. In the lower or anterior part, the boundary line of this surface runs parallel to, and a little outside of the *trigonum vesicale*. In the upper part it follows the outline of the vagina, from which it passes over to the cervix. The distance from the internal opening of the urethra to the neck of the womb is one inch and a quarter (3·2 centimètres). The bladder extends five-eighths of an inch (1·5 centimètres) upon the cervix. It is very liable to be reached by the vaginal rent, if the latter is made too high up or too horizontal. The lower part of the antero-superior wall carries in the middle line the *urethra*. In the uppermost part, a little outside of and behind the bladder, lies the *ureter*. In order to avoid the ureter and the bladder, the incision of the vagina should be made nearly an inch and a half (3·8 centimetres) below the uterus, and in a direction parallel to the ureter and the boundary line between the bladder and the vagina.'

The operation.

The operation has hitherto been performed on the right side only. In consequence of the position of the rectum on the left, it seems doubtful if the difficulties of performing it on that side would not render the operation impossible. This point can only be cleared up by experience, and in the meantime, the right side should certainly be selected. For the proper performance of the operation four assistants are neces-

[1] *Loc. cit.* p. 479.

sary, besides one who administers the anæsthetic. The patient is placed on her back on the operating table, with pelvis raised, and in the same position as for ovariotomy. In consequence of access of air *per vaginam* strict antiseptic precautions cannot be adopted. Before commencing the operation the cervix is dilated as much as possible by Barnes's bags, assisted, if necessary, by digital dilatation.

The operator stands on the right side of the patient, while an assistant, standing on her left, lays his hand on the uterus and draws it upwards and to the left, so as to put the skin on the stretch. The incision is commenced at a point one inch above the anterior superior spine of the ilium, and is carried inwards, in a slightly curved direction, until it reaches a point one and three-quarter inches above and outside the spine of the pubes. The skin and muscular and aponeurotic tissues are carefully divided, layer by layer, any arterial branches being secured as they are severed, until the transversalis fascia is reached. This is raised by a fine tenaculum, and an aperture is made in it, through which a director is introduced, and on this the fascia is divided in the whole length of the superficial incision. The operator now separates the peritoneum from the transversalis and iliac fascia with his fingers, and an assistant, placed on his left, elevates it, as well as the contained intestines, by means of a fine warmed napkin, and keeps it well out of the way during the rest of the operation. A third assistant now introduces a silver catheter into the bladder, and holds it in the position of the boundary line between it and the vagina, and below the uterus.

A blunt wooden instrument like the obturator of a speculum is introduced into the vagina, which is pushed up by it above the ilio-pectineal line. On this an incision is made by Paquelin's thermo-cautery heated to a red heat only, as far below the uterus as possible, and parallel to the ilio-pectineal line and the catheter felt in the bladder. When the vagina has been burnt through, the index fingers of both hands are pushed through the incision, and the vagina torn through as far forward as is deemed safe by the guide of the catheter in the bladder, and as far backwards as possible. When this has been done the uterus is depressed to the left, and the cervix lifted into the incision by the fingers, and the

membranes are ruptured.   Through the cervix thus elevated
the child is extracted, according to the presentation, either
by simple traction, by the forceps, or by turning.   Before
concluding the operation the bladder should be injected with
milk, to make sure that it has not been wounded.   Should
it be so, the laceration may be at once united by carbolised
gut.   The principal risk at this stage is hæmorrhage from the
vaginal vessels, which, however, fortunately did not give rise
to much trouble in any of the recent operations.   If it occurs
it must be dealt with as best we can, either by ligature, by
the actual cautery, or by thoroughly plugging the vaginal
wound with cotton-wool both through the incision and *per
vaginam*.   If the latter be not necessary the wound should
be cleaned by injecting a warm solution of weak carbolised
water (2 per cent.), its edges united by interrupted sutures,
and dressed as is deemed best.   The subsequent treatment
must be conducted on general surgical principles, and will
much resemble that necessary after other severe abdominal
operations, such as ovariotomy.   The vagina should be gently
syringed two or three times daily with a weak antiseptic
lotion.   The diet should be light and nutritious, chiefly con-
sisting of milk, beef-tea, and the like.   Pain, pyrexia, &c.,
must be treated as they arise.

CHAPTER VIII.

THE TRANSFUSION OF BLOOD.

THE transfusion of blood in desperate and apparently hopeless cases of hæmorrhage, offers a possible means of rescuing the patient which merits careful consideration. It has again and again attracted the attention of the profession, but has never become popularised in obstetric practice. The reason of this is not so much the inherent defects of the operation itself— for quite a sufficient number of successful cases are recorded to make it certain that it is occasionally a most valuable remedy—but the fact that the operation has been considered a delicate and difficult one, and that it has been deemed necessary to employ a complicated and expensive apparatus, which is never at hand when a sudden emergency arises. Whatever may be the difference of opinion about the value of transfusion, I think it must be admitted that it is of the utmost consequence to simplify the process in every possible way; and it is above all things necessary to show that the steps of the operation are such as can be readily performed by any ordinarily qualified practitioner, and that the apparatus is so simple and portable as to make it easy for any obstetrician to have it at hand. There are comparatively few who would consider it worth while to carry about with them, in ordinary everyday work, cumbrous and expensive instruments which may never be required in a life-long practice; and hence it is not unlikely that, in many cases in which transfusion might have proved useful, the opportunity of using it has been allowed to slip. Of late years the operation has attracted much attention, the method of performing it has been greatly simplified, and I think it will be easy to prove that all the essential apparatus may be purchased for a few shillings, and in so portable a form as to

Transfusion has never been popularised in obstetric practice.

Of late years the operation has been much simplified.

take up little or no room; so that it may be always carried in the obstetric bag ready for any possible emergency.

The history of the operation is of considerable interest. In Villari's 'Life of Savonarola' it is said to have been employed in the case of Pope Innocent VIII., in the year 1492, but I am not aware on what authority the statement is made. The first serious proposals for its performance do not seem to have been made until the latter half of the seventeenth century. It was first actually performed in France, by Denis, of Montpellier, although Lower, of Oxford, had previously made experiments on animals which satisfied him that it might be undertaken with success. In November, 1667, some months after Denis's case, he made a public experiment at Arundel House, in which twelve ounces of sheep's blood were injected into the veins of a healthy man, who is stated to have been very well after the operation, which must, therefore, have proved successful. These nearly simultaneous cases gave rise to a controversy as to priority of invention, which was long carried on with much bitterness.

The idea of resorting to transfusion after severe hæmorrhage does not seem to have been then entertained. It was recommended as a means of treatment in various diseased states, or with the extravagant hope of imparting new life and vigour to the old and decrepit. The blood of the lower animals only was used; and, under these circumstances, it is not surprising that the operation, although practised on several occasions, was never established as it might have been had its indications been better understood.

From that time it fell almost entirely into oblivion, although experiments and suggestions as to its applicability were occasionally made, especially by Dr. Harwood, Professor of Anatomy at Cambridge, who published a thesis on the subject in the year 1785. He, however, never carried his suggestions into practice, and, like his predecessors, only proposed to employ blood taken from the lower animals. In the year 1824 Dr. Blundell published his well-known work, entitled 'Researches, Physiological and Pathological,' which detailed a large number of experiments; and to that distinguished physician belongs the undoubted merit of having brought the subject prominently before the profession, and of pointing out the cases in which the operation might be

performed with hopes of success. Since the publication of this work, transfusion has been regarded as a legitimate operation under special circumstances ; but, although it has frequently been performed with success, and in spite of many interesting monographs on the subject, it has never become so established, as a general resource in suitable cases, as its advantages would seem to warrant. Within the last few years more attention has been paid to the subject, and the writings of Panum, Martin, and de Belina, abroad, and of Higginson, McDonnell, Hicks, Aveling, and Schäfer at home, amongst others, have thrown much light on many points connected with the operation.

Transfusion is practically only employed in cases of profuse hæmorrhage connected with labour, although it has been suggested as possibly of value in certain other puerperal conditions, such as eclampsia, or puerperal fever. Theoretically it may be expected to be useful in such diseases ; but, inasmuch as little or nothing is known of its practical effects in these diseased states, it is only possible here to discuss its use in cases of excessive hæmorrhage. Its action is probably twofold. 1st, the actual restitution of blood which has been lost. 2nd, the supply of a sufficient quantity of blood to stimulate the heart to contraction, and thus to enable the circulation to be carried on until fresh blood is formed. The influence of transfusion as a means of restoring lost blood must be trivial, since the quantity required to produce an effect is generally very small indeed, and never sufficient to counterbalance that which has been lost. Its stimulant action is no doubt of far more importance ; and if the operation be performed before the vital energies are entirely exhausted, the effect is often most marked. *Nature and object of the operation.*

In the earliest operations the blood used was always that of the lower animals, generally of the sheep. It has been thought by Brown-Séquard and others that the blood of some of the lower animals, especially of those in which the corpuscles are of smaller size than in man, as of the sheep, might be used with safety, provided it is not too rich in carbonic acid and too poor in oxygen, and injected in small quantity only. Landois,[1] however, has conclusively proved that the blood of any of the lower animals has a most in- *Use of blood taken from the lower animals.*

[1] *Die Transfusion des Blutes,* Leipsic, 1875.

jurious effect on the human red corpuscles, which rapidly become swollen and decolourised, and discharge their colouring matter into the serum. It is certain, therefore, that this plan cannot be adopted in practice.

Difficulties from coagulation of fibrine.

The great practical difficulty in transfusion has always been the coagulation of the blood very shortly after it has been removed from the body. When fresh-drawn blood is exposed to the atmosphere, the fibrine commences to solidify rapidly, generally in from three to four minutes, sometimes much sooner. It is obvious that the moment fibrination has commenced the blood is, *ipso facto*, unfitted for transfusion, not only because it can be no longer passed readily through the injecting apparatus, but because of the great danger of propelling small masses of fibrine into the circulation, and thus causing embolism. Hence if no attempt be made to prevent this difficulty, it is essential, no matter what apparatus is used, to hurry on the operation so as to inject before fibrination has begun. This is a fatal objection, for there is no operation in the whole range of surgery in which calmness and deliberation are so essential, the more so as the surroundings of the patient in these unfortunate cases are such as to tax the presence of mind and coolness of the practitioner and his assistants to the utmost.

Methods of obviating coagulation.

All the recent improvements have had for their object the avoidance of coagulation, and practically this has been effected in one of three ways. 1st, by immediate transfusion from arm to arm, without allowing the blood to be exposed to the atmosphere, according to the methods proposed by Aveling, Roussel, and Schäfer. 2nd, by adding to the blood certain chemical reagents which have the property of preventing coagulation. 3rd, removal of the fibrine entirely, by promoting its coagulation and straining the blood, so that the liquor sanguinis and blood-corpuscles alone are injected.

Inasmuch as the success of the operation altogether depends on the method adopted, it will be well, before going further, to consider briefly the advantages and disadvantages of each of these plans.

Immediate transfusion.

Aveling's method.

The method of immediate transfusion has been brought prominently before the profession by Dr. Aveling, who has invented an ingenious apparatus for performing it. The apparatus consists essentially of a miniature Higginson's

syringe, without valves, and with a small silver canula at either end. One canula is inserted into the vein of the person supplying blood, the other into a vein of the patient, and by a curious manipulation of the syringe, subsequently to be described, the blood is carried from one vein into the other. It must be admitted that, if there were no practical difficulties, this instrument would be admirable, and it is therefore not surprising that it should have met with so much favour from the profession. I cannot but think, however, that the operation is not so simple as at first sight appears, and that therefore it wants one of the essential elements required in any procedure for performing transfusion. One of my objections is, that it is by no means easy to work the apparatus without considerable practice. Of this I have satisfied myself by asking members of my class to work it after reading the printed directions, and finding that they are not always able to do so at once. Of course it may be said that it is easy to acquire the necessary manipulative skill; but when the necessity for transfusion arises, there is no time left for practising with the instrument, and it is essential that an apparatus, to be universally applicable, should be capable of being used immediately, and without previous experience. Other objections are the necessity of several assistants, the uncertainty of there being a sufficient circulation of blood in the veins of the donor to afford a constant supply, and the possibility of the whole apparatus being disturbed by restlessness or jactitation on the part of the patient. For these reasons it seems to me that this plan of immediate transfusion is not so simple, nor so generally applicable as defibrination. Still, it is impossible not to recognise its merits, and it is certainly well worthy of further study and investigation.

Another method of immediate transfusion is that recommended by Roussel,[1] whose apparatus has recently attracted considerable attention. It possesses many undoubted advantages, and is beyond doubt a valuable addition to our means of performing the operation. It has, however, the great disadvantage of being costly and complicated, and hence I do not believe that it is likely to come into general use.

Roussel's method.

[1] *Obstetrical Transactions*, vol. xviii.

Schäfer's method.

The third method is that recommended by Dr. Schäfer in his recent excellent reports on transfusion submitted to the Obstetrical Society.[1] Schäfer suggests two methods of performing the operation: one from vein to vein, the other from artery to artery. The latter, he holds, has the advantage of supplying pure oxygenated blood, under the best possible conditions for securing the amelioration of a patient suffering from the effects of profuse hæmorrhage. The necessary operative proceedings are, however, somewhat complicated, and it seems to me very doubtful if this plan is likely to be at all commonly used. His method of immediate transfusion, however, is very simple, and is well worthy of trial. In his experiments on the lower animals it answered admirably. I am not aware that it has yet been tried on the human subject, but I do not see any practical difficulty in its application. For the description of the operation I have inserted Dr. Schäfer's own directions for the performance of both arterial and venous immediate transfusion.

Addition of chemical agents to prevent coagulation.

The second plan for obviating the bad effects of clotting is the addition of some substance to the blood which shall prevent coagulation. It is well known that several salts have this property, and the experiments made in the case of cholera patients prove that solutions of some of them may be injected into the venous system without injury. This method has been specially advocated by Dr. Braxton Hicks, who uses a solution of three ounces of fresh phosphate of soda in a pint of water, about six ounces of which are added to the quantity of blood to be injected. He has narrated 4 cases,[2] in which this plan was adopted successfully, so far as the prevention of coagulation was concerned. It certainly enables the operation to be performed with deliberation and care, but it is somewhat complicated; and it may often happen that the necessary chemicals are not at hand. A further objection is the bulk of fluid which must be injected, and there is reason to believe that this has, in some cases, seriously embarrassed the heart's action, and interfered with the success of the operation. In many of the successful cases of transfusion the amount of blood injected has been very small, not more than two ounces. Dr.

[1] *Obstetrical Transactions*, vol. xxi.
[2] *Guy's Hospital Reports*, vol. xiv.

Richardson proposes to prevent coagulation by the addition of liquor ammoniæ to the blood, in the proportion of two minims diluted with twenty minims of water to each ounce of blood.

The last method, and the one which, on the whole, I believe to be the simplest and most effectual, is defibrination. It has been chiefly practised in this country by Dr. McDonnell, of Dublin, who has published several very interesting cases in which he employed it, and abroad by Martin, of Berlin, and de Belina, of Paris. The process of removing the fibrine is simple in the extreme, and occupies a few minutes only. Another advantage is that the blood to be transfused may be prepared quietly in an adjoining apartment, so that the operation may be performed with the greatest calmness and deliberation, and the donor is spared the excitement and distress which the sight of the apparently moribund patient is apt to cause, and which, as Dr. Hicks has truly pointed out, may interfere with the free flow of blood. The researches of Panum, Brown-Séquard, and others, have proved that the blood-corpuscles are the true vivifying element, and that defibrinated blood acts as well, in every respect, as that containing fibrine. It has been proved that the fibrine is reproduced within a short time,[1] and the whole tendency of modern research is to regard it, not as an essential element of the blood, but as an excrementitious product, resulting from the degradation of tissue, which may, therefore, be advantageously removed. Another advantage derived from defibrination is, that the corpuscles are freely exposed to the atmosphere, oxygen is taken up, and carbonic acid given off, and the dangers which Brown-Séquard has shown to arise from the use of blood containing too much carbonic acid are thereby avoided. There can be, therefore, no physiological objection to the removal of the fibrine, which, moreover, takes away all practical difficulty from the operation. The straining to which the defibrinated blood is subjected entirely prevents the possibility of even the most minute particle of fibrine being contained in the injected fluid; the risk from embolism is, therefore, less than in any of the other processes already referred to. My own experience of this plan is limited to 3 cases, but in 2 it answered so well that I can

Defibrination of the blood.

[1] Panum, *Virchow's Arch.* vol. xxvii.

conceive no reasonable objection to it. I should be inclined to say that transfusion, thus performed, is amongst the simplest of surgical operations—an opinion which the experience of McDonnell and others fully confirms.

Transfusion of milk. Recently the intra-venous injection of freshly drawn warm milk has been recommended as a substitute for blood, chiefly in America. It was first used by Dr. Hodder, of Toronto, but has been introduced and strongly advocated by Thomas, of New York, who has used it twice after ovariotomy. Brown-Séquard in experimenting on the lower animals found that it answered as well as either fresh or defibrinated blood, and about half an hour after the injection no trace of the milk-corpuscles could be found in the blood. Schäfer, however, found that the action of milk on the blood-corpuscles was highly deleterious, and that it introduces the germs of septic organisms likely to produce very serious results. He, therefore, pronounces strongly against its use.

Statistical results. The number of cases of transfusion are perhaps not sufficient to admit of completely reliable conclusions. It is certain, however, that transfusion has often been the means of rescuing the patient when apparently at the point of death, and after all other means of treatment had failed. Professor Martin records 57 cases, in 43 of which transfusion was completely successful, and in 7 temporarily so; while in the remaining 7 no reaction took place. Dr. Higginson, of Liverpool, has had 15 cases, 10 of which were successful. Figures such as these are encouraging, and they are sufficient to prove that the operation is one which at least offers a fair hope of success, and which no obstetrician would be justified in neglecting, when the patient is sinking from the exhaustion of profuse hæmorrhage. It is to be hoped also that further experience may prove it to be of value in other cases, in which its use has been suggested, but not, as yet, put to the test of experiment.

Possible dangers of the operation. The possible risks of the operation would seem to be the danger of injecting minute particles of fibrine which form emboli, of bubbles of air, or of overwhelming the action of the heart by injecting too rapidly, or in too great quantity. These may be, to a great extent, prevented by careful attention to the proper performance of the operation, and it does not clearly appear, from the recorded cases, that they have ever

proved fatal.   We must also bear in mind that transfusion is seldom or never likely to be attempted until the patient is in a state which would otherwise almost certainly preclude the hope of recovery, and in which, therefore, much more hazardous proceedings would be fully justified.

The cases suitable for transfusion are those in which the patient is reduced to an extreme state of exhaustion from hæmorrhage during or after labour or miscarriage, whether by the repeated losses of placenta prævia, or the more sudden and profuse flooding of post-partum hæmorrhage.   The operation will not be contemplated until other and simpler means have been tried and failed, or until the symptoms indicate that life is on the verge of extinction.   If the patient should be deadly pale and cold, with no pulse at the wrist, or one that is scarcely perceptible ; if she be unable to swallow, or vomits incessantly ; if she lie in an unconscious state ; if jactitation, or convulsions, or repeated faintings should occur ; if the respiration be laborious, or very rapid and sighing ; if the pupil do not act under the influence of light, it is evident that she is in a condition of extreme danger, and it is, under such circumstances, that transfusion, performed sufficiently soon, offers a fair prospect of success.   It does not necessarily follow because one or other of these symptoms is present that there is no chance of recovery under ordinary treatment, and indeed it is within the experience of all that patients have rallied under apparently the most hopeless conditions. But when several of them occur together, the prospect of recovery is much diminished, and transfusion would then be fully justified, especially as there is no reason to think that a fatal result has ever been directly traced to its employment. Indeed, like most other obstetric operations, it is more likely to be postponed until too late to be of good service, than to be employed too early ; and in some of the cases reported as unsuccessful, it was not performed until respiration had ceased, and death had actually taken place.   It has sometimes been said that transfusion should never be employed if the uterus be not firmly contracted, so as to prevent the injected blood again escaping through the uterine sinuses.   The cases in which this is likely to occur are few ; and if one were met with, the escape of blood could be prevented by the injection into the uterus of the perchloride of iron.

Cases suitable for transfusion.

Descrip-
tion of the
operation.In describing the operation I shall limit myself to an account of Aveling's and Schäfer's method of immediate transfusion, and to that of injecting defibrinated blood. I consider myself justified in omitting any account of the numerous instruments which have been invented for the purpose of injecting pure blood, since I believe the practical difficulties are too great ever to render this form of operation serviceable. The great objection to most of them is their cost and complexity; and as long as any special apparatus is considered essential, the full benefits to be derived from transfusion are not likely to be realised. The necessity for employing it arises suddenly; it may be in a locality in

Fig. 178.
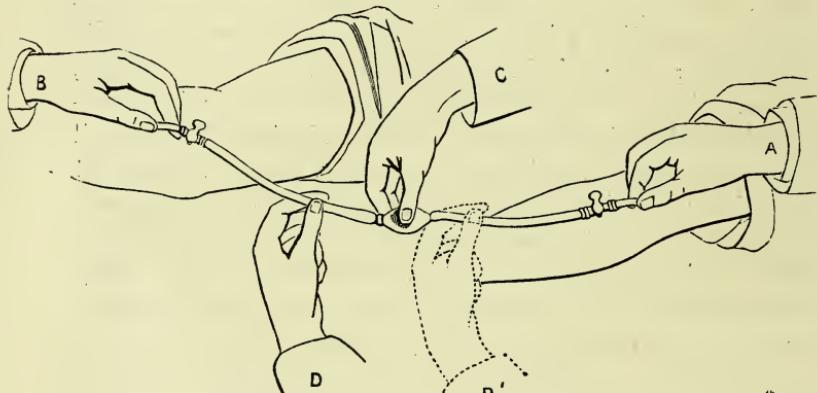
METHOD OF TRANSFUSION BY AVELING'S APPARATUS.

which it is impossible to procure a special instrument; and it would be well if it were understood that transfusion may be safely and effectually performed by the simplest means. In many of the successful cases an ordinary syringe was used; in one, in the absence of other instruments, a child's toy syringe was employed. I have myself performed it with a simple syringe purchased at the nearest chemist's shop, when a special transfusion apparatus failed to act satisfactorily.

Method of
perform-
ing imme-
diate
transfu-
sion by
Aveling's
method.In immediate transfusion (fig. 178), the donor is seated close to the patient, and the veins in the arms of each having been opened, the silver canula at either end of the instrument is introduced into them (A B). The tube between the bulb and the donor is now pinched (D), so as to form a

vacuum, and the bulb becomes filled with blood from the
donor. The finger is now removed so as to compress the distal
tube (D′), and the bulb being compressed (C), its contents
are injected into the patient's vein. The bulb is calculated
to hold about two drachms, so that the amount injected
·can be estimated by the number of times it is emptied. The
risk of injecting air is prevented by filling the syringe with
water, which is injected before the blood.

Schäfer's Directions for Immediate Transfusion.

' Procure two glass canulas of appropriate size and shape
(see fig. 179), and a piece of black india-rubber tubing seven
inches long, and not less than a quarter of an
inch bore, fitted to the canulas. This appara-
tus could always be improvised.

Direct
venous
transfu-
sion.

Apparatus
required.

Fig. 179.
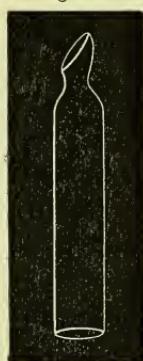
' Place the transfusion tube in a basin of
hot water containing a little carbonate of soda.
Put a tape round the arm of the patient just
below the place where the vein is to be opened
and another just above. Expose the vein by
an incision through the skin, which should be
made transversely if the position of the vein
cannot be made out through the skin. Clear
a small piece of the vein with forceps, and slip

Procedure.

·a pointed piece of card underneath it. By a snip with
scissors make an oblique opening into the vein, and partly
insert a small blunt instrument (such as a wool-needle) so
that the aperture is not lost. Remove the upper tape. Next
prepare the vein of the giver. To do this put tapes around
the arm just below and above the place where the vein is
to be opened. Expose the vein by a longitudinal incision
through the skin. Clear a small piece of the vessel with
forceps and pass a thread ligature underneath. A slip of card
may also be placed under this vein. Make a snip into the
vein just above the ligature, and then, taking the transfusion
tube out of the soda solution, slip one of the canulas into
the vein of the giver, and tie it in with a simple knot, which
·can be readily untied. Let the giver go to the bedside and
place his arm alongside that of the patient. Hold the end of
the india-rubber tube with the second canula up a little,
·and release the lower tape on the arm of the blood-giver. As

soon as blood flows out of the second canula pinch the india-rubber tube close to the canula, so as to stop the flow, and removing the wood-needle, slip the end of the canula into the vein of the patient, hold it there, and allow the blood to pass freely along the tube. Three minutes will generally be long enough for the flow, which can be stopped by compressing the vein of the giver below the canula. Both canulas may now be withdrawn and the ligature removed from the vein of the giver, the cut veins being dealt with in the usual way. Of course, the other tape on the arm of the donor must be removed as soon as the transfusion is over.

' Instead of using the transfusion tube empty, it may be filled with soda solution, to the exclusion of air. It is necessary to have one or two spring clips on the tube to prevent the escape of the solution. This is a much better plan than the other, for the blood need not be allowed to flow into the tube until the second canula is inserted, and then, by opening the clips, it may drive the soda solution before it into the vein. The small quantity of carbonate of soda solution necessary to fill the simple tube will do the patient no harm.

Direct centripetal arterial transfusion.

' In the first place we have to determine what artery or arteries would be most available for the purpose. The (left) radial artery could be most easily dealt with, and its use would involve less subsequent inconvenience to the donor of the blood than any other. But if it is considered necessary to choose some other artery, I think the dorsal artery of the foot should be selected, for its employment presents several advantages. It is a minor artery, but nevertheless large enough for the insertion of a canula; it is comparatively superficial, and pretty easily found; and by causing the person yielding the blood to stand up, a great amount of pressure may be obtained in it. In the bloodless patient, especially if there be much subcutaneous fat, this artery might not be readily found.

Apparatus required.

' A piece of india-rubber tubing, six or seven inches long, two glass canulas of appropriate size and shape, and some spring clips, two of which should be small for compressing the arteries, the others larger and adapted for clipping the tube. The smaller clips might be dispensed with, and ligatures fastened with a slip bow might be used instead, in the way Lower recommended. Before commencing, it is

important to ensure that the india-rubber tube cannot slip off the canulas. It ought to be secured to them by tight ligatures, or by binding wire. This precaution is necessary because the arterial blood is under considerable pressure. This would tend to force the tubes apart and might cause copious hæmorrhage.

'The transfusion tube is to be placed as before in carbonate of soda solution.

'The artery of the patient must first be exposed. To do this make an incision an inch in length through the skin over the line of the artery, and then divide to an equal extent the subcutaneous tissue and fascia which cover it. About three-quarters of an inch in length of the vessel is to be separated from the ensheathing connective tissue and from its accompanying veins by slipping a blunt instrument, such as an aneurism needle or the blade of a forceps, underneath and moving it up and down. A small piece of card, cut into a long triangular shape, may then be placed under instead of the needle. A ligature is then tied tightly around the lower end of the piece of artery, another is looped loosely around the middle, and a spring clip is put on close to the upper end. The vessel may now be opened just above the lower ligature by a snip with the scissors. *Procedure.*

'If the artery have any branch at the exposed part this ought to be tied before commencing to isolate the vessel. In the person who is to yield the blood exactly the same process is carried out.

'The transfusion tube is next filled (by suction) with soda solution, and this is prevented from escaping by one or two spring clips on the tube.

'One of the glass terminals is tied into the artery of the giver, and the other into the artery of the patient, the ends of both being directed towards the heart.

'All is now ready for the transfusion. To effect this, remove the clips on the india-rubber tube and open the clip on the artery of the patient, then open—not remove—that on the artery of the giver, and keep it open one minute, or a little longer if it seems advisable. Allow the clips to close again, and if the patient's condition is ameliorated, the operation may be ended by tying the arteries—first that of the giver, then that of the patient—just above the clips.

'Finally, cut out and remove the canulas, together with the pieces of artery into which they are tied.'

<p style="margin-left: 2em;">Injection of defibrinated blood.</p>

For injecting defibrinated blood various contrivances have been used. McDonnell's instrument is a simple cylinder with a nozzle attached, from which the blood is propelled by gravitation. When the propulsive power is insufficient, increased pressure is applied by breathing forcibly into the open end of the receiver. De Belina's instrument is on the same principle, only atmospheric pressure is supplied by a contrivance similar to Richardson's spray-producer, attached to one end. The idea is simple, but there is some doubt of a gravitation instrument being sufficiently powerful, and it certainly failed in my hands. I have had valves applied to Aveling's instrument, so that it works by compression of the bulb, like an ordinary Higginson's syringe. This, with a single silver canula at one end, for introduction into the vein, forms a perfect and inexpensive transfusion apparatus, taking up scarcely any space. If it be not at hand, any small syringe, with a tolerably fine nozzle, may be used.

<p style="margin-left: 2em;">Mode of preparing the blood.</p>

The first step of the operation is defibrination of the blood, which should, if possible, be prepared in an apartment adjoining the patient's. The blood should be taken from the arm of a strong and healthy man. The quality cannot be unimportant, and, in some recorded cases, the failure of the operation has been attributed to the fact of the donor having been a weakly female. The supply from a woman might also prove insufficient; and, although it has been shown that blood from two or more persons may be used with safety, yet such a change necessarily causes delay, and should, if possible, be avoided. A vein having been opened, eight or ten ounces of blood are withdrawn, and received into some perfectly clean vessel, such as a dessert finger-glass. As it flows it should be briskly agitated with a clean silver fork, or a glass rod, and very shortly, strings of fibrine begin to form. It is now strained through a piece of fine muslin, previously dipped in hot water, into a second vessel which is floating in water at a temperature of about 105°. By this straining the fibrine and all air-bubbles resulting from the agitation are removed, and, if there be no excessive hurry, it might be well to repeat the straining a second time. If the vessel be

kept floating in warm water, the blood is prevented from getting cool, and we can now proceed to prepare the arm of the patient for injection.

This is the most delicate and difficult part of the opera- Mode of tion, since the veins are generally collapsed and empty, and exposing by no means easy to find. The best way of exposing them the veins is that practised by McDonnell, who pinches up a fold of the for trans-skin at the bend of the elbow, and transfixes it with a fine fusion. tenotomy knife or scalpel, so making a gaping wound in the integument, at the bottom of which they are seen lying. A probe should now be passed underneath the vein selected for opening, so as to avoid the chance of its being lost at any subsequent stage of the operation. This is a point of some importance, and from the neglect of this precaution I have been obliged to open another vein than that originally fixed on. A small portion of the vein being raised with the forceps, a nick is made into it for the passage of the canula.

The prepared blood is now brought to the bedside, and, Injection the apparatus having been previously filled with blood to of the avoid the risk of injecting any bubbles of air, the canula is blood. inserted into the opening made in the vein, and transfusion commenced. It should be constantly borne in mind that this part of the operation should be conducted with the greatest caution, the blood introduced very slowly, and the effect on the patient carefully watched. The injection may be pro-ceeded with until some perceptible effect is produced, which will generally be a return of the pulsation, first at the heart and subsequently at the wrist, an increase in the temperature of the body, greater depth and frequency of the respirations, and a general appearance of returning animation about the countenance. Sometimes the arms have been thrown about, or spasmodic twitchings of the face have taken place. The quantity of blood required to produce these effects varies greatly, but in the majority of cases has been very small. Occasionally 2 ounces have proved sufficient, and the average may be taken as ranging between 4 and 6 ; although in a few cases between 10 and 20 have been used. The practical rule is to proceed very slowly with the injection until some perceptible result is observed. Should embarrassed or fre-quent respiration supervene, we may suspect that we have been injecting either too great a quantity of blood, or with

too much force and rapidity, and the operation should at once be suspended, and not resumed until the suspicious symptoms have passed away. It may happen that the effects of the transfusion have been highly satisfactory, but that in the course of time there is evidence of returning syncope. This may possibly be prevented by the administration of stimulants ; but if these fail there is no reason why a fresh supply of blood should not again be injected, but this should be done before the effects of the first transfusion have entirely passed away.

Secondary effects of transfusion.

The subsequent effects in successful cases of transfusion merit careful study. In some few cases death is said to have happened within a few weeks, with symptoms resembling pyæmia. Too little is known on this point, however, to justify any positive conclusions with regard to it.

PART V.

THE PUERPERAL STATE.

CHAPTER I.

THE PUERPERAL STATE AND ITS MANAGEMENT.

THE key to the management of women after labour, and to the proper understanding of the many important diseases which may then occur, is to be found in a study of the phenomena following delivery, and of the changes going on in the mother's system during the puerperal period. No doubt natural labour is a physiological and healthy function, and during recovery from its effects disease should not occur. It must not be forgotten, however, that none of our patients are under physiologically healthy conditions. The surroundings of the lying-in woman, the effects of civilisation, of errors of diet, of defective cleanliness, of exposure to contagion, and of a hundred other conditions, which it is impossible to appreciate, have most important influences on the results of childbirth. Hence it follows that labour, even under the most favourable conditions, is attended with considerable risk.

Import-
ance of
studying
the puer-
peral
state.

It is not easy to say with accuracy what is the precise mortality accompanying childbirth in ordinary domestic practice, since the returns derived from the reports of the Registrar-General, or from private sources, are manifestly open to serious error. The nearest approach to a reliable estimate is that made by Dr. Matthews Duncan,[1] who calculates, from figures derived from various sources, that no fewer than 1 out of every 120 women, delivered at or near the full time, dies within four weeks of childbirth. This indicates

The mor-
tality of
childbirth.

[1] The ' Mortality of Childbed,' *Edin. Med. Journ.* Nov. 1869.

a mortality far above that which has been generally believed to accompany child-bearing under favourable circumstances. It, however, closely approximates to a similar estimate made by McClintock,[1] who calculates the mortality in England and Wales as 1 in 126 ; and in the upper and middle classes alone, where the conditions may naturally be supposed to be more favourable, at 1 in 146 ; more recently he has come to the conclusion from his own increased experience, and the published results of the practice of others, that 1 in 100 would more correctly represent the rate of puerperal mortality.[2] In these calculations there are some obvious sources of error, since they include deaths from all causes within four weeks of delivery, some of which must have been independent of the puerperal state.

But it is not the deaths alone which should be considered. All practitioners know how large a number of their patients suffer from morbid states which may be directly traced to the effects of child-bearing.   It is impossible to arrive at any statistical conclusion on this point, but it must have a very sensible and important influence on the health of child-bearing women.

Altera-
tions in
the blood
after deli-
very.

The state of the blood during pregnancy, already referred to (vol. i. p. 144), has an important bearing on the puerperal state.   There is hyperinosis, which is largely increased by the changes going on immediately after the birth of the child ; for then the large supply of blood, which has been going to the uterus, is suddenly stopped, and the system must also get rid of a quantity of effete matter thrown into the circulation, in consequence of the degenerative changes occurring in the muscular fibres of the uterus.   Hence all the depurative channels, by which this can be eliminated, are called on to act with great energy.   If, in addition, the peculiar condition of the generative tract be borne in mind—viz., the large open vessels on its inner surface—the partially bared inner surface of the uterus, and the channels for absorption existing in consequence of slight lacerations in the cervix or vagina—it is not a matter of surprise that septic diseases should be so common.

It will be well to consider successively the various changes

[1] *Dublin Quarterly Journ.* Aug. 1869.
[2] *Brit. Med. Journ.* Aug. 10, 1878.

going on after delivery, and then we shall be in a better position for studying the rational management of the puerperal state. Condition after delivery.

Some degree of nervous shock or exhaustion is observable after most labours. In many cases it is entirely absent; in others it is well marked. Its amount is in proportion to the severity of the labour, and the susceptibility of the patient; and it is, therefore, most likely to be excessive in women who have suffered greatly from pain, who have undergone much muscular exertion, or who have been weakened from undue loss of blood. It is evidenced by a feeling of exhaustion and fatigue, and not uncommonly there is some shivering, which soon passes off, and is generally followed by refreshing sleep. The extreme nervous susceptibility continues for a considerable time after delivery, and indicates the necessity of keeping the lying-in patient as free from all sources of excitement as possible. Nervous shock.

Immediately after delivery the pulse falls, and the importance of this, as indicating a favourable state of the patient, has already been alluded to. The condition of the pulse has been carefully studied by Blot,[1] who has shown that this diminution, which he believes to be connected with a diminished tension in the arteries, due to the sudden arrest of the uterine circulation, continues in a large proportion of cases, for a considerable number of days after delivery; and, as a matter of clinical import, as long as it does, the patient may be considered to be in a favourable state. In many instances the slowness of the pulse is remarkable, often sinking to 50 or even 40 beats per minute. Any increase above the normal rate, especially if at all continuous, should always be carefully noted, and looked on with suspicion. In connection with this subject, however, it must be remembered that in puerperal women the most trivial circumstances may cause a sudden rise of the pulse. This must be familiar to every practical obstetrician, who has constant opportunities of observing this effect after any transient excitement or fatigue. In lying-in hospitals it has generally been observed that the occurrence of any particularly bad case will send up the pulse of all the other patients who may have heard of it. Fall of the pulse.

[1] *Arch. Gén. de Méd.* 1864.

Tempera-
ture in the
puerperal
state.

The temperature in the lying-in state affords much valuable information. During, and for a short time after labour, there is a slight elevation. It soon falls to, or even somewhat below, the normal level. Squire found that the fall occurred within twenty-four hours, sometimes within twelve hours, after the termination of labour.[1] For a few days there is often a slight increase of temperature, especially towards the evening, which is probably caused by the rapid oxidation of tissue in connection with the involution of the uterus. In about forty-eight hours there is a rise connected with the establishment of lactation, amounting to one or two degrees over the normal level; but this again subsides as soon as the milk is freely secreted. Credé has also shown[2] that rapid, but transient, rises of temperature may occur at any period, connected with trivial causes, such as constipation, errors of diet, or mental disturbances. But if there be any rise of temperature which is at all continuous, especially to over 100° Fahr., and associated with rapidity of the pulse, there is reason to fear the existence of some complication.

The secre-
tions and
excre-
tions.

The various secretions and excretions are carried on with increased activity after labour. The skin especially acts freely, the patient often sweating profusely. There is also an abundant secretion of urine, but not uncommonly a difficulty of voiding it, either on account of temporary paralysis of the neck of the bladder, resulting from the pressure to which it has been subjected, or from swelling and occlusion of the urethra. For the same reason the rectum is sluggish for a time, and constipation is not infrequent. The appetite is generally indifferent, and the patient is often thirsty.

Secretion
of milk.

Generally in about forty-eight hours the secretion of milk becomes established, and this is occasionally accompanied by a certain amount of constitutional irritation. The breasts often become turgid, hot, and painful. There may, or may not, be some general disturbance, quickening of pulse, elevation of temperature, possibly slight shivering, and a general sense of oppression, which are quickly relieved as the milk is formed, and the breasts emptied by suckling. Squire says that the most constant phenomenon connected

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[1] 'Puerperal Temperatures,' *Obstetrical Transactions*, vol. ix.
[2] *Monat. f. Geburt.* Dec. 1868.

with the temperature is a slight elevation as the milk is secreted, rapidly falling when lactation is established. Barker noted elevation, either of temperature or pulse, in only 4 out of 52 cases which were carefully watched. There can be little doubt that the importance of the so-called 'milk fever' has been immensely exaggerated, and its existence, as a normal accompaniment of the puerperal state, is more than doubtful. It is certain, however, that in a small minority of cases, there is an appreciable amount of disturbance about the time that the milk is formed. Out of 423 cases, Macan [1] found that in 114, or about 27 per cent., there was no rise of temperature ; in 226 the temperature did rise to 100°, and over, and of these in 32, or a little over 7 per cent., the only ascertainable cause was a painful or distended condition of the breast. Many modern writers, such as Winckel, Grünewaldt, and d'Espine, entirely deny the connection of this disturbance with lactation, and refer it to a slight and transient septicæmia. Graily Hewitt remarks that it is most commonly met with when the patient is kept low and on deficient diet after delivery, especially when the system is below par from hæmorrhage, or any other cause. This observation will, no doubt, account for the comparative rarity of febrile disturbance in connection with lactation in these days, in which the starving of puerperal patients is not considered necessary. It is certain that anything deserving the name of milk fever is now altogether exceptional, and such feverishness as exists is generally quite transient. It is also a fact, that it is most apt to occur in delicate and weakly women, especially in those who do not, or are unable to, nurse. There does not, however, seem to be any sufficient reason for referring it, even when tolerably well marked, to septicæmia. The relief which attends the emptying of the breasts seems sufficient to prove its connection with lactation, and the discomfort which is necessarily associated with the swollen and turgid mammæ is, of itself, quite sufficient to explain it.

Milk fever not a normal phenomenon.

In the urine of women during lactation an appreciable amount of sugar may readily be detected. The amount varies according to the condition of the breasts. It increases when they are turgid and congested, and is, therefore, most

Sugar in the urine.

[1] *Dublin Journ. of Med. Science*, May 1878.

abundant in women in whom the breasts are not emptied, as when the child is dead, or when lactation is not attempted.

Immediately after delivery the uterus contracts firmly, and can be felt at the lower part of the abdomen as a hard, firm mass, about the size of a cricket ball (Plate V.). After a time it again relaxes somewhat, and alternate relaxations and contractions go on, at intervals, for a considerable time after the expulsion of the placenta. The more complete and permanent the contraction, the greater the safety and comfort of the patient; for when the organ remains in a state of partial relaxation, coagula are apt to be retained in its cavity, while, for the same reason, air enters more readily into it. Hence decomposition is favoured, and the chances of septic absorption are much increased; while, even when this does not occur, the muscular fibres are excited to contract, and severe after-pains are produced.

After the first few days the diminution in the size of the uterus progresses with great rapidity. By about the sixth day it is so much lessened as to project not more than $1\frac{1}{2}$ or 2 inches above the pelvic brim, while by the eleventh day it is no longer to be made out by abdominal palpation. Its increased size is, however, still apparent per vaginam, and should occasion arise for making internal examination, the mass of the lower segment of the uterus, with its flabby and patulous cervix, can be felt for some weeks after delivery. This may sometimes be of practical value in cases in which it is necessary to ascertain the fact of recent delivery, and under these circumstances, as pointed out by Simpson, the uterine sound would also enable us to prove that the cavity of the uterus is considerably elongated. Indeed the normal condition of the uterus and cervix is not regained until six weeks or two months after labour. These observations are corroborated by investigations on the weight of the organ at different periods after labour. Thus Heschl[1] has shown that the uterus, immediately after delivery, weighs about 22 to 24 oz.; within a week, it weighs 19 to 21 oz.; and at the end of the second week, 10 to 11 oz. only. At the end of the third week, it weighs 5 to 7 oz.; but it is not until the end of the second month that it reaches its normal weight.

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[1] *Researches on the Conduct of the Human Uterus after Delivery.*

PLATE V.

Mintern Bros lith

Rectum

Pouch of Douglas
containing serum

Fold of cervical canal

Cellular tissue

Vagina

Anus, upper part.

Uterus

Visceral peritoneum
Parietal peritoneum

Placental site

Uterine cavity containing
blood.-clot

Cervix uteri

Cellular tissue

Bladder

Vein

Symphysis pubis

Urethra
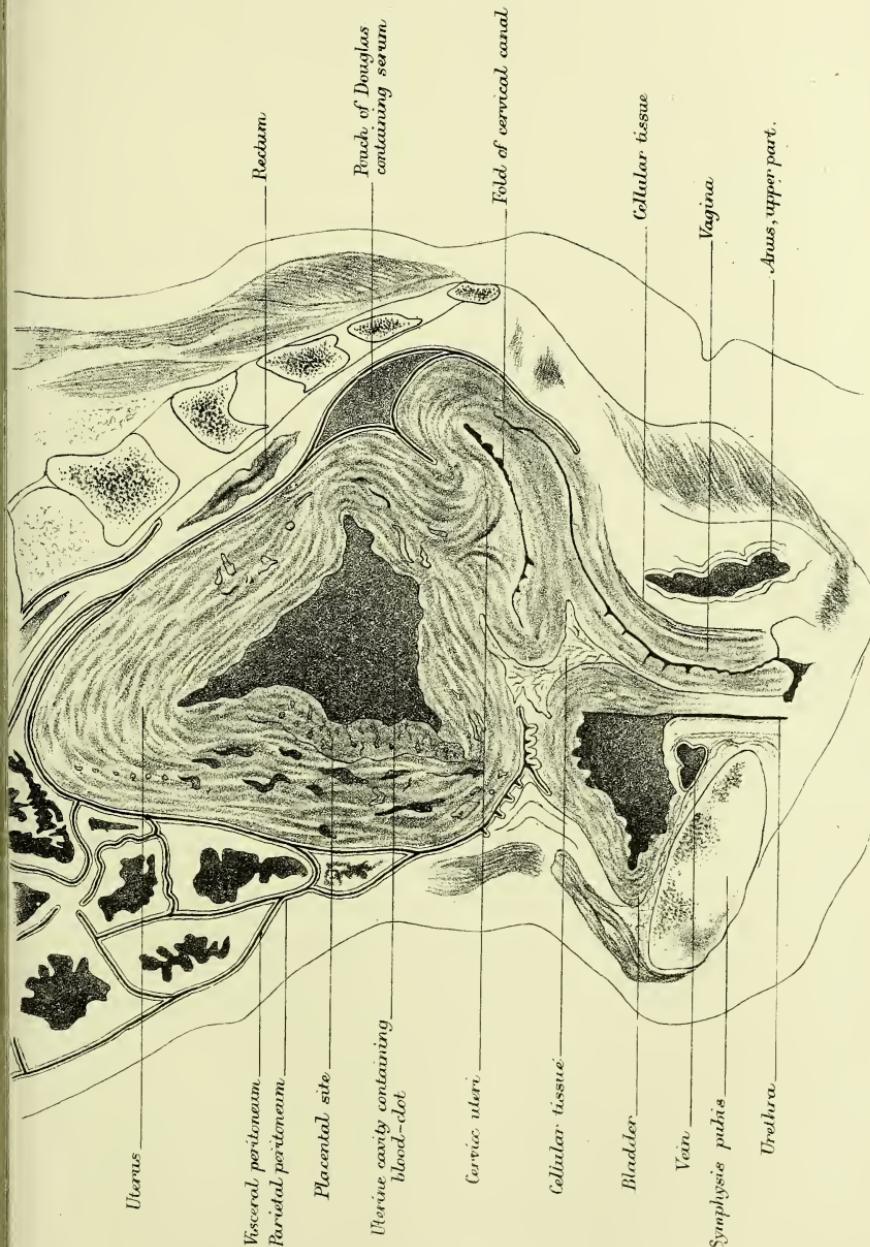
VERTICAL MESIAL SECTION (FROZEN) OF PELVIS WITH POST PARTUM UTERUS,—
and pelvic organs in situ.—1¾ hours after delivery.—after Barbour.

Hence it appears that the most rapid diminution occurs during the second week after delivery.

The mode in which this diminution in size is effected is by the transformation of the muscular fibres into molecular fat, which is absorbed into the maternal vascular system, which, therefore, becomes loaded with a large amount of effete material. Heschl has shown that the entire mass of the enlarged uterine muscles are removed, and replaced by newly-formed fibres, which commence to be developed about the fourth week after delivery, the change being complete about the end of the second month. Generally speaking, involution goes on without interruption. It is, however, apt to be interfered with by a variety of causes, such as premature exertion, intercurrent disease, and, very probably, by neglect of lactation. Hence the uterus often remains large and bulky, and the foundation for many subsequent uterine ailments is laid. *Fatty transformation of the muscular fibres.*

Williams has drawn attention to changes occurring in the vessels of the uterus, some of which seem to be permanent, and may, should further observations corroborate his investigations, prove of value in enabling us to ascertain whether a uterus is nulliparous or the reverse; a question which may be of medico-legal importance. After pregnancy he found all the vessels enlarged in calibre. The coats of the arteries are thickened and hypertrophied, and this he has observed even in the uteri of aged women who have not borne children for many years. The venous sinuses, especially at the placental site, have their walls greatly thickened and convoluted, and contain in their centre a small clot of blood (fig. 180). This thickening attains its greatest dimensions in the third month after gestation, but traces of it may be detected as late as ten or twelve weeks after labour. *Changes in the uterine vessels.*

The changes going on in the lining membrane of the uterus immediately after delivery are of great importance in leading to a knowledge of the puerperal state, and have already been discussed when describing the decidua (vol. i. p. 94). Its cavity is covered with a reddish-grey film, formed of blood and fibrine. The open mouths of the uterine sinuses are still visible, more especially over the site of the placenta, and thrombi may be seen projecting from them. The placental site can be distinctly made out, in the form of an *Changes in the uterine mucous membrane.*

irregularly oval patch, where the lining membrane is thicker than elsewhere (see Plate V.).

The vagina soon contracts, and, by the time the puerperal month is over, it has returned to its normal dimensions, but after child-bearing it always remains more lax, and less rugose, than in nulliparæ. The vulva, at first very lax and much distended, soon regains its former state. The abdominal parietes remain loose and flabby for a considerable time, and the white streaks, produced by the distention of the

Fig. 180.
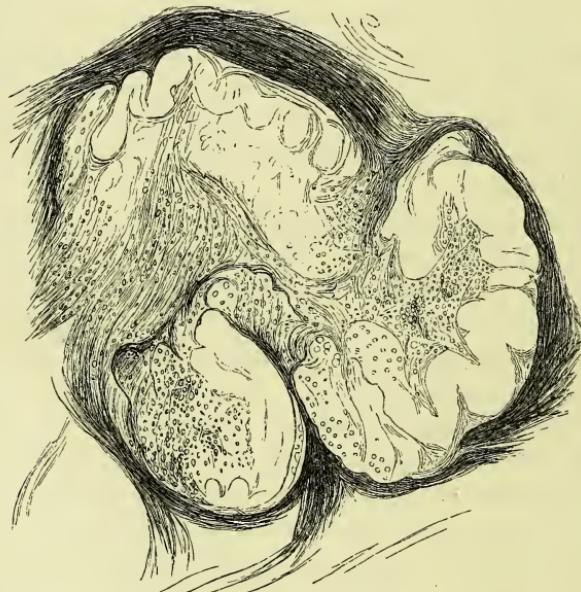
SECTION OF A UTERINE SINUS FROM THE PLACENTAL SITE NINE WEEKS AFTER DELIVERY.
(After Williams.)

cutis, very generally become permanent. In some women, especially when proper support by bandaging has not been given, the abdomen remains permanently loose and pendulous.

The
lochial
discharge.
From the time of delivery, up to about three weeks afterwards, a discharge escapes from the interior of the uterus, known as the *lochia*. At first this consists almost entirely of pure blood, mixed with a variable amount of coagula. If efficient uterine contraction has not been secured after the expulsion of the placenta, coagula of considerable size are

frequently expelled with the lochia for one or two days after
delivery. In three or four days the distinctly bloody
character of the lochia is altered. They have a reddish
watery appearance, and are known as the *lochia rubra* or
cruenta. According to the researches of Wertheimer,[1] they
are at this time composed chiefly of blood-corpuscles, mixed
with epithelium scales, mucous corpuscles, and the débris of
the decidua. The change in the appearance of the discharge
progresses gradually, and about the seventh or eighth day it
has no longer a red colour, but is a pale greenish fluid, with
a peculiar sickening and disagreeable odour, and is familiarly
described as the 'green waters.' It now contains a small
quantity of blood-corpuscles, which lessen in amount from
day to day, but a considerable number of pus-corpuscles,
which remain the principal constituent of the discharge until
it ceases. Besides these, epithelial scales, fatty granules,
and crystals of cholesterine are observed. Occasionally a
small infusorium, which has been named the ' trichomonas
vaginalis,' has been detected; but it is not of constant
occurrence.

The amount of the lochia varies much, and in some
women it is habitually more abundant than in others. Under
ordinary circumstances it is very scanty after the first fort-
night, but occasionally it continues somewhat abundant for a
month or more, without any bad results. It is apt again to
become of a red colour, and to increase in quantity, in con-
sequence of any slight excitement or disturbance. If this
red discharge continues for any undue length of time, there
is reason to suspect some abnormality, and it may not un-
frequently be traced to slight lacerations about the cervix,
which have not healed properly. This result may also
follow premature exertion, interfering with the proper involu-
tion of the uterus; and the patient should certainly not be
allowed to move about as long as much coloured discharge
is going on.

Variation in its amount and duration.

Occasionally the lochia have an intensely fœtid odour.
This must always give rise to some anxiety, since it often
indicates the retention and putrefaction of coagula, and in-
volves the risk of septic absorption. It is not very rare,
however, to observe a most disagreeable odour persist in the

Occa- sional fœ- tor of the discharge.

[1] Virchow's *Arch.* 1861.

lochia without any bad results. The fœtor always deserves careful attention, and an endeavour should be made to obviate it by directing the nurse to syringe out the vagina freely night and morning with Condy's fluid and water; while, if it be associated with quickened pulse and elevated temperature, other measures, to be subsequently described, will be necessary.

The after-pains. The *after-pains*, which many child-bearing women dread even more than the labour-pains, are irregular contractions, occurring for a varying time after delivery, and resulting from the efforts of the uterus to expel coagula which have formed in its interior. If, therefore, special care be taken to secure complete and permanent contraction after labour, they rarely occur, or to a very slight extent. Their dependence on uterine inertia is evidenced by the common observation that they are seldom met with in primiparæ, in whom uterine contraction may be supposed to be more efficient, and are more frequent in women who have borne many children. They are a preventable complication, and one which need not give rise to any anxiety; they are, indeed, rather salutary than the reverse, for, if coagula be retained in utero, the sooner they are expelled the better. The after-pains generally begin a few hours after delivery, and continue in bad cases for three or four days, but seldom longer. They are generally increased when the mammæ are irritated by suction. When at their height they are often relieved by the expulsion of the coagula. In some severe cases they are apparently neuralgic in character, and do not seem to depend on the retention of coagula. They may be readily distinguished from pains due to more serious causes, by feeling the enlarged uterus harden under their influence, by the uterus not being tender on pressure, and by the absence of any constitutional symptoms.

Management of women after delivery. The management of women after childbirth has varied much at different times, according to fashion or theory. The dread of inflammation long influenced the professional mind, and caused the adoption of a strictly antiphlogistic diet, which led to a tardy convalescence. The recognition of the essentially physiological character of labour has resulted in more sound views, with manifest advantage to our patients. The main facts to bear in mind with regard to the puerperal

woman are, her nervous susceptibility, which necessitates quiet and absence of all excitement; the importance of favouring involution by prolonged rest; and the risk of septicæmia, which calls for perfect cleanliness and attention to hygienic precautions.

As soon as we are satisfied that the uterus is perfectly contracted, and that all risk of hæmorrhage is over, the patient should be left to sleep. Many practitioners administer an opiate; but, as a matter of routine, this is certainly not good practice, since it checks the contractions of the uterus, and often produces unpleasant effects. Still, if the labour have been long and tedious, and the patient be much exhausted, 15 or 20 drops of Battley's solution may be administered with advantage. *The administration of opiates is generally unadvisable.*

Within a few hours the patient should be seen, and at the first visit particular attention should be paid to the state of the pulse, the uterus, and the bladder. The pulse during the whole period of convalescence should be carefully watched, and, if it be at all elevated, the temperature should at once be taken. If the pulse and temperature remain normal, we may be satisfied that things are going on well; but, if the one be quickened and the other elevated, some disturbance or complication may be apprehended. The abdomen should be felt, to see that the uterus is not unduly distended, and that there is no tenderness. After the first day or two this is no longer necessary. *Attention to the state of the pulse, bladder, and uterus.*

Sometimes the patient cannot at first void the urine, and the application of a hot sponge over the pubes may enable her to do so. If the retention of urine be due to temporary paralysis of the bladder, three or four 20-minim doses of the liquid extract of ergot, at intervals of half an hour, may prove successful. Many hours should not be allowed to elapse without relieving the patient by the catheter, since prolonged retention is only likely to make matters worse. Subsequently, it may be necessary to empty the bladder night and morning, until the patient regain her power over it, or until the swelling of the urethra subsides, and this will generally be the case in a few days. Occasionally the bladder becomes largely distended, and is relieved to some degree by dribbling of urine from the urethra. Such a state of things may deceive the patient and nurse, and *Treatment of retention of urine.*

may produce serious consequences by causing cystitis. Attention to the condition of the abdomen will prevent the practitioner from being deceived, for in addition to some constitutional disturbance, a large, tender, and fluctuating swelling will be found in the hypogastric region distinct from the uterus, which it displaces to one or other side. The catheter will at once prove that this is produced by distension of the bladder.

Treatment of severe afterpains.

If the after-pains be very severe, an opiate may be administered, or, if the lochia be not over-abundant, a linseed-meal poultice, sprinkled with laudanum, or with the chloroform and belladonna liniment, may be applied. If proper care have been taken to induce uterine contraction, they will seldom be sufficiently severe to require treatment. In America, quinine, in doses of 10 grains twice daily, has been strongly recommended, especially when opiates fail and when the pains are neuralgic in character, and I have found this remedy answer extremely well. The quinine is best given in solution with 10 or 15 minims of hydrobromic acid, which materially lessens the unpleasant head symptoms often accompanying the administration of such large doses.

Diet and regimen.

The diet of the puerperal patient claims careful attention, the more so as old prejudices in this respect are as yet far from exploded, and as it is by no means rare to find mothers and nurses who still cling tenaciously to the idea that it is essential to prescribe a low regimen for many days after labour. The erroneousness of this plan is now so thoroughly recognised that it is hardly necessary to argue the point. There is, however, a tendency in some to err in the opposite direction, which leads them to insist on the patient's consuming solid food too soon after delivery, before she has regained her appetite, thereby producing nausea and intestinal derangement. Our best guide in this matter is the feelings of the patient herself. If, as is often the case, she be disinclined to eat, there is no reason why she should be urged to do so. A good cup of beef-tea, some bread and milk, or an egg beat up with milk, may generally be given with advantage shortly after delivery, and many patients are not inclined to take more for the first day or so. If the patient be hungry there is no reason why she should not have some more solid, but easily digested food,

such as white fish, chicken, or sweetbread; and, after a day or two, she may resume her ordinary diet, bearing in mind that, being confined to bed, she cannot with advantage consume the same amount of solid food as when she is up and about. Dr. Oldham, in his presidential address to the Obstetrical Society,[1] has some apposite remarks on this point, which are worthy of quotation :—' A puerperal month under the guidance of a monthly nurse is easily drawn out, and it is well if a love of the comforts of illness and the persuasion of being delicate, which are the infirmities of many women, do not induce a feeble life, which long survives after the occasion of it is forgotten. I know no reason why, if a woman is confined early in the morning, she should not have her breakfast of tea and toast at nine, her luncheon from some digestible meat at one, her cup of tea at five, her dinner with chicken at seven, and her tea again at nine, or the equivalent, according to the variation of her habits of living. Of course, there is the common-sense selection of articles of food, guarding against excess, and avoiding stimulants. But gruel and slops and all intermediate feeding are to be avoided.' No one who has seen both methods adopted can fail to have been struck with the more rapid and satisfactory convalescence which takes place when the patient's strength is not weakened by an unnecessarily low diet. Stimulants, as a rule, are not required; but, if the patient be weakly and exhausted, or if she be accustomed to their use, there can be no reasonable objection to their judicious administration.

Immediately after delivery a warm napkin is applied to the vulva, and, after the patient has rested a little, the nurse removes the soiled linen from the bed, and washes the external genitals. It is impossible to pay too much attention during the subsequent progress of the case to the maintenance of perfect cleanliness. Perfectly antiseptic midwifery is no doubt an impossibility, but a near approach to it may be made, and the greater the care taken the more certainly will the safety of the patient be insured.[2] It will be a wise precaution to advise the nurse never to touch the genitals for the first few days, unless her hands have been moistened

Attention to cleanliness, &c.

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[1] *Obstet. Trans.* vol. vi.
[2] The following rules I have for the past year or two distributed to the monthly nurses attending my own patients, with the result, I believe, of a

in a 1-in-20 solution of carbolic acid, or 1-in-1,000 solution of perchloride of mercury, or lubricated with carbolised oil. The linen should be frequently changed, and all dirty linen and discharges immediately removed from the apartment. The vulva should be washed daily with a solution of perchloride of mercury of the strength of 1-in-2,000, or with Condy's fluid and water, and the patient will derive great comfort from having the vagina syringed gently out once a day with the same solution. It is well also to have the vulva thoroughly washed with corrosive sublimate lotion at the commencement of labour, and the vagina syringed at the same time. The remarkable diminution of mortality which has followed such antiseptic precautions in Lying-in Hospitals well shows the importance of these measures. The room should be kept tolerably cool, and fresh air freely admitted.

Action of the bowels.　　　It is customary, on the morning of the second or third day, to secure an action of the bowels; and there is no better way of doing this than by a large enema of soap and water. If the patient object to this, and the bowels have not acted, some mild aperient may be administered, such as a small

marked improvement in their comfort, and a more generally satisfactory convalescence.

Antiseptic Rules for Monthly Nurses.

1. Two bottles are supplied to each patient. One contains a mixture of perchloride of mercury, of the strength of one part to 1,000 of water (called the 1-in-1,000 solution), the other carbolised oil (1-in-8).

2. A small basin containing the 1-in-1,000 solution must always stand by the bedside of the patient, and the nurse must *thoroughly* rinse her hands in it every time she touches the patient in the neighbourhood of the genital organs, for washing or any other purpose whatsoever, before or during labour, and for a week after delivery.

3. All sponges, vaginal and rectal pipes, catheters, &c., must be dipped in the 1-in-1,000 solution before being used. The surfaces of slippers, bedpans, &c., should also be sponged with it.

4. Vaginal pipes, enema-tubes, catheters, &c., should be smeared with the carbolised oil before use.

5. Unless express directions are given to the contrary, the vagina should be syringed twice daily after delivery with the 1-in-1,000 solution, with an equal quantity of hot water added to it.

6. All water used for washing should have sufficient Condy's fluid dropped into it to give it a pale pink colour.

7. All soiled linen, diapers, &c., should be immediately removed from the bedroom.

N.B.—These rules are for the purpose of protecting the patient from the risk arising from accidental contamination of the hands, sponges, &c. It is, therefore, hoped that they will be faithfully and minutely adhered to.

dose of castor oil, a few grains of colocynth and henbane pill, or the popular French aperient, the ' Tamar Indien.'

The management of suckling and of the breasts forms an important part of the duties of the monthly nurse, which the practitioner should himself superintend. This will be more conveniently discussed under the head of lactation.

<div style="float:right">Lactation.</div>

The most important part of the management of the puerperal state is the securing to the patient prolonged rest in the horizontal position, in order to favour proper involution of the uterus. For the first few days she should be kept as quiet and still as possible, not receiving the visits of any but her nearest relatives, thus avoiding all chance of undue excitement. It is customary among the better classes for the patient to remain in bed for eight or ten days; but, provided she be doing well, there can be no objection to her lying on the outside of the bed, or slipping on to a sofa, somewhat sooner. After ten days or a fortnight she may be permitted to sit on a chair for a little; but I am convinced that the longer she can be persuaded to retain the recumbent position, the more complete and satisfactory will be the progress of involution, and she should not be allowed to walk about until the third week, about which time she may also be permitted to take a drive. If it be borne in mind that it takes from six weeks to two months for the uterus to regain its natural size, the reason for prolonged rest will be obvious. The judicious practitioner, however, while insisting on this point, will take measures at the same time, not to allow the patient to lapse into the habits of an invalid, or to give the necessary rest the semblance of disease.

<div style="float:right">Import-
ance of
prolonged
rest.</div>

Towards the termination of the puerperal month some slight tonic, such as small doses of quinine with phosphoric acid, may be often given with advantage, especially if convalescence be tardy. Nothing is so beneficial in restoring the patient to her usual health as change of air, and in the upper classes a short visit to the seaside may generally be recommended, with the certainty of much benefit.

<div style="float:right">Subse-
quent
treatment.</div>

CHAPTER II.

MANAGEMENT OF THE INFANT, LACTATION, ETC.

Commencement of respiration.
ALMOST immediately after its expulsion, a healthy child cries aloud, thereby showing that respiration is established, and this may be taken as a signal of its safety. The first respiratory movements are excited, partially by reflex action resulting from the contact of the cold external air with the cutaneous nerves, and partly by the direct irritation of the medulla oblongata, in consequence of the circulation through it of blood no longer oxygenated in the placenta.

Apparent death of the new-born child.
Not infrequently the child is born in an apparently lifeless state. This is especially likely to be the case when the second stage of labour has been unduly prolonged, so that the head has been subjected to long-continued pressure. The utero-placental circulation is also apt to be injuriously interfered with before the birth of the child when a tardy labour has produced tonic contraction of the uterus, and consequent closure of the uterine sinuses; or, more rarely, from such causes as the injudicious administration of ergot, premature separation of the placenta, or compression of the umbilical cord. In any of these cases it is probable that the arrest of the utero-placental circulation induces attempts at inspiration, which are necessarily fruitless, since air cannot reach the lungs, and the fœtus may die asphyxiated; the existence of the respiratory movement being proved on post-mortem examination by the presence in the lungs of liquor amnii, mucus, and meconium, and by the extravasation of blood from the rupture of their engorged vessels.

Appearance of the child in such cases.
In most cases, when the child is born in a state of apparent asphyxia, its face is swollen and of a dark livid colour. It not infrequently makes one or two feeble and gasping efforts at respiration, without any definite cry; on

auscultation the heart may be heard to beat weakly and slowly. Under such circumstances there is a fair hope of its recovery. In other cases the child, instead of being turgid and livid in the face, is pale, with flaccid limbs, and no appreciable cardiac action; then the prognosis is much more unfavourable.

No time should be lost in endeavouring to excite respiration, and, at first, this must be done by applying suitable stimulants to the cutaneous nerves, in the hope of exciting reflex action. The cord should be at once tied, and the child removed from the mother; for the final uterine contractions have so completely arrested the utero-placental circulation as to render it no longer of any value. If the face be very livid, a few drops of blood may with advantage be allowed to flow from the cord before it is tied, with the view of relieving the embarrassed circulation. Very often some slight stimulus, such as one or two sharp slaps on the thorax, or rapidly rubbing the body with brandy poured into the palms of the hands, will suffice to induce respiration. Failing this, nothing acts so well as the sudden and instantaneous application of heat and cold. For this purpose extremely hot water is placed in one basin, and quite cold water in another. Taking the child by the shoulders and legs, it should be dipped for a single moment into the hot water, and then into the cold; and these alternate applications may be repeated once or twice, as occasion requires. The effect of this measure is often very marked, and I have frequently seen it succeed when prolonged efforts at artificial respiration have been made in vain.

Treatment of apparent death.

If these means fail, an endeavour must be at once made to carry on respiration artificially. The best means of doing this have been exhaustively studied by Dr. Champneys,[1] who considers the only two reliable means of carrying on artificial respiration are those of Schultze and Sylvester. The Sylvester method is, on the whole, that which is most easily applied, and, on account of the compressibility of the thorax, it is peculiarly suitable for infants. The child being laid on its back, with the shoulders slightly elevated, the elbows are grasped by the operator, and alternately raised above the head, and slowly depressed against the sides of the thorax,

Artificial respiration.

[1] *Medico-Chir. Trans.* vol. lxiv. and lxv.

so as to produce the effect of inspiration and expiration. If this do not succeed, the Marshall Hall method may be substituted; and one or more of the plans' of exciting reflex action through the cutaneous nerves may be alternated with it.

Insuffla-
tion of the
lungs.
Other means of exciting respiration have been recommended. One of them, much used abroad, is the artificial insufflation of the lungs by means of a flexible catheter guided into the glottis, or by means of a handkerchief placed over the child's mouth and directly insufflating the lungs. It is not difficult to pass the end of a catheter into the glottis, using the little finger as a guide; and once in position, it may be used to blow air gently into the lungs, which is expelled by compression on the thorax, the insufflation being repeated at short intervals of about ten seconds. One advantage of this plan is, that it allows the liquor amnii and other fluids, which may have been drawn into the lungs in the premature efforts at respiration before birth, to be sucked up into the catheter, and so removed from the lungs. Dr. Champneys recommends that when the catheter is passed into the trachea, for about three inches from the child's mouth, the thorax should be gently compressed, and then air should be blown through the catheter. The effect of this manœuvre is that any mucus or fluids in the trachea pass upwards through the glottis into the pharynx. The same effect may be produced, but less perfectly, by placing the hand over the nostrils of the child, blowing into its mouth, and immediately afterwards compressing the thorax. One of these methods should certainly be tried, if all other means have failed. Faradization along the course of the phrenic nerves is a promising means of inducing respiration, which should be used if the proper apparatus can be procured. Encouragement to persevere in our endeavours to resuscitate the child may be derived from the numerous authenticated instances of success after the lapse of a considerable time, even of an hour or more. As long as the cardiac pulsations continue, however feebly, there is no reason to despair, and Champneys has collected some apparently authenticated cases in which children seemingly dead have been buried for some hours and then dug up and restored to life.

When the child cries lustily from the first, it is cus-

tomary for the nurse to wash and dress it as soon as her Washing
immediate attendance on the mother is no longer required. and dress-
For this purpose it is placed in a bath of warm water, and child.
carefully soaped and sponged from head to foot. With the
view of facilitating the removal of the unctuous material
with which it is covered, it is usual to anoint it with cold
cream or olive oil, which is washed off in the bath. Nurses
are apt to use undue roughness in endeavouring to remove
every particle of the vernix caseosa, small portions of which
are often firmly adherent. This mistake should be avoided,
as these particles will soon dry up and become spontaneously
detached. The cord is generally wrapped in a small piece of
charred linen, which is supposed to have some slight anti-
septic property, and this is renewed from day to day until
the cord has withered and separated. This generally occurs
within a week ; and a small pad of soft linen is then placed
over the umbilicus, and supported by a flannel belly-band,
placed round the abdomen, which should not be too tight,
for fear of embarrassing the respiration. By this means the
tendency to umbilical hernia is prevented.

The clothing of the infant varies according to fashion and Clothing,
the circumstances of the parents. The important points to &c.
bear in mind are that it should be warm (since newly-born
children are extremely susceptible to cold), and at the same
time light and sufficiently loose to allow free play to the
limbs and thorax. All tight bandaging and swaddling, such
as is so common in some parts of the Continent, should be
avoided, and the clothes should be fastened by strings or by
sewing, and no pins used. At the present day it is customary
not to use caps, so that the head may be kept cool. The
utmost possible attention should be paid to cleanliness, and
the child should be regularly bathed in tepid water, at first
once daily, and after the first few weeks, both night and
morning. After drying, the flexures of the thighs and arms,
and the nates, should be dusted with violet powder or fuller's
earth, to prevent chafing of the skin. The excrements
should be received in napkins wrapped round the hips, and
great care is required to change the napkins as often as they
are wet or soiled, otherwise troublesome irritation will arise.
A neglect of this precaution, and the washing of the napkins
with coarse soap or soda, are among the principal causes of

the eruptions and excoriations so common in badly cared for children. When washed and dressed the child may be placed in its cradle, and covered with soft blankets or an eider-down quilt.

Applica-
tion of the
child to
the breast.

As soon as the mother has rested a little, it is advisable to place the child to the breast. This is useful to the mother by favouring uterine contraction. Even now there is in the breasts a variable quantity of the peculiar fluid known as

The colo-
strum and
its proper-
ties.

colostrum. This is a viscid yellowish secretion, different in appearance from the thin bluish milk which is subsequently formed. Examined under the microscope it is found to contain some milk-globules, and a number of large granular and small fat corpuscles. It has a purgative property, and soon produces, with less irritation than any of the laxatives so generally used, a discharge of the meconium with which the bowels are loaded. Hence the accoucheur should prohibit the common practice of administering castor oil, or other aperient, within the first few days after birth, although there can be no objection to it, in special cases, if the bowels appear to act inefficiently and with difficulty.

Over-
frequent
suckling
should be
avoided.

For the first few days, and until the secretion of milk is thoroughly established, the child should be put to the breast at long intervals only. Constant attempts at suckling an empty breast lead to nothing but disappointment, both to the mother and child, and, by unduly irritating the mammæ, sometimes to positive harm. Therefore, for the first day or two, it is sufficient if the child be applied to the breast twice, or at most three times, in the twenty-four hours. Nor is it necessary to be apprehensive, as many mothers naturally are, that the child will suffer from want of food. A few spoonfuls of milk and water being given from time to time, the child may generally wait without injury until the milk is secreted. This is generally about the third day, when

Secretion
of milk.

the secretion is found to be a whitish fluid, more watery in appearance than cow's milk, and showing under the microscope an abundance of minute spherical globules, refracting light strongly, which are abundant in proportion to the quality of the milk. A certain number of granular corpuscles may also be observed shortly after the birth of the child, but after the first month, these should have almost altogether disappeared. The reaction of human milk is decidedly

alkaline, and the taste much sweeter than that of cow's milk.

The importance to the mother of nursing her own child, whenever her health permits, on account of the favourable influence of lactation in promoting a proper involution of the uterus, has already been insisted on. Unless there be some positive contra-indication, such as a marked strumous cachexia, an hereditary phthisical tendency, or great general debility, it is the duty of the accoucheur to urge the mother to attempt lactation, even if it be not carried on more than a month or two. It is, however, the fact that in the upper classes of society a large number of patients are unable to nurse, even though willing and anxious to do so. In some there is hardly any lacteal secretion at all, in others there is at first an over-abundance of watery and innutritious milk, which floods the breasts, and soon dies away altogether. *Importance of nursing when practicable.*

Whenever the mother cannot or will not nurse, the question will arise as to the method of bringing up the child. From many causes there is an increasing tendency to resort to bottle-feeding, instead of procuring the services of a wet nurse, even when the question of expense does not come into consideration. No long experience is required to prove that hand-feeding is a bad and imperfect substitute for nature's mode, and one which the practitioner should discourage whenever it lies in his power to do so. It is true that, in many cases, bottle-fed children do well ; but there is good reason to believe that, even when apparently most successful, the children are not so strong in after life as they would have been had they been brought up at the breast. When, in addition, it is borne in mind how much of the success of hand-feeding depends on intelligent care on the part of the nurse, what evils are apt to accrue from the injurious selection of the food, and from ignorance of the commonest laws of dietetics, there is abundant reason for urging the substitution of a wet nurse, whenever the mother is unable to undertake the suckling of her child. It must be admitted that good hand-feeding is better than bad wet-nursing, and the success of the latter hinges on the proper selection of a wet nurse. As this falls within the duties of the practitioner, it will be well to point out the qualities which should be sought for in a wet nurse, before pro- *When the mother cannot nurse, a wet nurse should be procured.*

ceeding to discuss the mode of rearing the child at the breast.

In selecting a wet nurse we should endeavour to choose a strong, healthy woman, who should not be over 30, or 35 years of age at the outside, since the quality of the milk deteriorates in women who are more advanced in life. For a similar reason a very young woman of 16 or 17 should be rejected. It is needless to say that care must be taken to ascertain the absence of all traces of constitutional disease, especially marks of scrofula, or enlarged cervical or inguinal glands, which may possibly be due to antecedent syphilitic taint. If the nurse be of good muscular development, healthy-looking, with a clear complexion, and sound teeth (indicating a generally good state of health), the colour of the hair and eyes is of secondary importance. It is commonly stated that brunettes make better nurses than blondes, but this is by no means necessarily the case; and provided all the other points be favourable, fairness of skin and hair need be no bar to the selection of a nurse. The breasts should be pear-shaped, rather firm, as indicating an abundance of gland-tissue, and with the superficial veins well marked. Large, flabby breasts owe much of their size to an undue deposit of fat, and are generally unfavourable. The nipple should be prominent, not too large, and free from cracks and erosions, which, if existing, might lead to subsequent difficulties in nursing. On pressing the breast the milk should flow from it easily in a number of small jets, and some of it should be preserved for examination. It should be of a bluish-white colour, and when placed under the microscope, the field should be covered with an abundance of milk-corpuscles, and the large granular corpuscles of the colostrum should have entirely disappeared. If the latter be observed in any quantity in a woman who has been confined five or six weeks, the inference is that the milk is inferior in quality. It is not often that the practitioner has an opportunity of inquiring into the moral qualities of the nurse, although much valuable information might be derived from a knowledge of her previous character. An irascible, excitable, or highly nervous woman will certainly make a bad nurse, and the most trivial causes might afterwards interfere with the quality of her milk. Particular attention should

be paid to the nurse's own child, since its condition affords the best criterion of the quality of her milk. It should be plump, well-nourished, and free from all blemishes. If it be at all thin and wizened, especially if there be any snuffling at the nose, or should any eruption exist affording the slightest suspicion of a syphilitic taint, the nurse should be unhesitatingly rejected.

The management of suckling is much the same whether the child is nursed by the mother or by a wet nurse. As soon as the supply of milk is sufficiently established, the child must be put to the breast at short intervals, at first of about two hours, and, in about a month or six weeks, of three hours. From the first few days it is a matter of the greatest importance, both to the mother and child, to acquire regular habits in this respect. If the mother get into the way of allowing the infant to take the breast whenever it cries, as a means of keeping it quiet, her own health must soon suffer, to say nothing of the discomfort of being incessantly tied to the child's side; while the child itself has not sufficient rest to digest its food, and, very shortly, diarrhœa, or other symptoms of dyspepsia, are pretty sure to follow. After a month or two the infant should be trained to require the breast less often at night, so as to enable the mother to have an undisturbed sleep of six or seven hours. For this purpose she should arrange the times of nursing so as to give the breast just before she goes to bed, and not again until the early morning. If the child should require food in the interval, a little milk and water, from the bottle, may be advantageously given.

Management of suckling.

The diet of the nursing woman should be arranged on ordinary principles of hygiene. It should be abundant, simple, and nutritious, but all rich and stimulating articles of food should be avoided. A common error in the diet of wet nurses is over-feeding, which constantly leads to deterioration of the milk. Many of these women, before entering on their functions, have been living on the simplest and even sparest diet, and not uncommonly, in the better class of houses, they are suddenly given heavy meat meals three and even four times a day, and often three or four glasses of stout. It is hardly a matter of astonishment that, under such circumstances, their milk should be found to disagree.

Diet of nursing women.

For a nursing woman in good health two good meat meals a day, with two glasses of beer or porter, and as much milk and bread and butter as she likes to take in the intervals, should be amply sufficient. Plenty of moderate exercise should be taken, and the more the nurse and child are out in the open air, provided the weather be reasonably fine, the better it is for both.

Signs of successful lactation.
Carried on methodically in this manner, wet nursing should give but little trouble. In the intervals between its meals the child sleeps most of its time, and wakes with regularity to feed; but if the child be wakeful and restless, cry after feeding, have disordered bowels, and, above all, if it do not gain, week by week, in weight (a point which should be, from time to time, ascertained by the scales), we may conclude that there is either some grave defect in the management of suckling, or that the milk is not agreeing. Should this unsatisfactory progress continue, in spite of our endeavours to remedy it, there is no resource left but the alteration of the diet, either by changing the nurse, or by bringing up the child by hand. The former should be preferred whenever it is practicable, and in the upper ranks of life, it is by no means rare to have to change the wet nurse two or three times, before one is met with whose milk agrees perfectly. If the child have reached six or seven months of age, it may be preferable to wean it altogether, especially if the mother have nursed it, as hand-feeding is much less objectionable if the infant have had the breast for even a few months.

Period of weaning.
As a rule, weaning should not be attempted until dentition is fairly established, that being the sign that nature has prepared the child for an alteration of food; and it is better that the main portion of the diet should be breast milk until at least six or seven teeth have appeared. This is a safer guide than any arbitrary rule taken from the age of the child, since the commencement of dentition varies much in different cases. About the sixth or seventh month it is a good plan to commence the use of some suitable artificial food once a day, so as to relieve the strain on the mother or nurse, and prepare the child for weaning, which should always be a very gradual process. In this way a meal of rusks, of entire wheat flour, or of beef, or chicken-tea, with

bread crumb in it, may be given with advantage; and, as the period for weaning arrives, a second meal may be added, and so eventually the child may be weaned without distress to itself or trouble to the nurse.

The disorders of lactation are numerous, and as they frequently come under the notice of the practitioner, it is necessary to allude to some of the most common and important.

The advice of the accoucheur is often required in cases in which it has been determined that the patient is not to nurse, when we desire to get rid of the milk as soon as possible, or when, at the time of weaning, the same object is sought. The extreme heat and distension of the breasts, in the former class of cases, often give rise to much distress. A smart saline aperient will aid in removing the milk, and for this purpose a double Seidlitz powder, or frequent small doses of sulphate of magnesia, act well; while, at the same time, the patient should be advised to take as small a quantity of fluid as possible. Iodide of potassium in large doses, of 20 or 25 grains, repeated twice or thrice, has a remarkable effect in arresting the secretion of milk. This observation was first empirically made by observing that the secretion of milk was arrested when this drug was administered for some other cause; and I have frequently found it answer remarkably well. The distension of the breasts is best relieved by covering them with a layer of lint or cotton wool, soaked in a spirit lotion, or eau de Cologne and water, over which oiled silk is placed, and by directing the nurse to rub them gently with warm oil, whenever they get hard and lumpy. Breast-pumps and similar contrivances only irritate the breasts, and do more harm than good. The local application of bella-donna has been strongly recommended as a means for preventing lacteal secretion. As usually applied, in the form of belladonna plaster, it is likely to prove hurtful, since the breast often enlarges after the plasters are applied, and the pressure of the unyielding leather on which they are spread produces intense suffering. A better way of using it is by rubbing down a drachm of the extract of belladonna with an ounce of glycerine, and applying this on lint. In some cases it answers extremely well; but it is very uncertain in its action, and frequently is quite useless.

Defective
secretion
of milk.

A deficiency of milk in nursing mothers is a very common source of difficulty. In a wet nurse this drawback is, of course, an indication for changing the nurse; but to the mother the importance of nursing is so great, that an endeavour must be made either to increase the flow of milk, or to supplement it by other food. Unfortunately, little reliance can be placed on any of the so-called galactagogues. The only one which in recent times has attracted attention is the leaves of the castor-oil plant, which, made into poultices and applied to the breast, are said to have a beneficial effect in increasing the flow of milk. More reliance must be placed in a sufficiency of nutritious food, especially such as contains phosphatic elements; stewed eels, oysters, and other kinds of shell-fish, and the Revalenta Arabica, are recommended by Dr. Routh, who has paid some attention to this point,[1] as peculiarly appropriate. If the amount of milk be decidedly deficient, the child should be less often applied to the breast, so as to allow milk to collect, and properly prepared cow's milk from a bottle should be given alternately with the breast. This mixed diet generally answers well, and is far preferable to pure hand-feeding.

Depressed
nipples.

A not uncommon source of difficulty is a depressed condition of the nipples, which is generally produced by the constant pressure of the stays. The result is, that the child, unable to grasp the nipple, and wearied with ineffectual efforts, may at last refuse the breast altogether. An endeavour should be made to elongate the nipple before putting it into the child's mouth, either by the fingers, or by some form of breast-pump, which here finds a useful application. In the worst class of cases, when the nipple is permanently depressed, it may be necessary to let the child suck through a glass nipple shield, to which is attached an india-rubber tube, similar to that of a sucking-bottle; this it is generally well able to do.

Fissures
and ex-
coriations
of the
nipples.

Fissures and excoriations of the nipples are common causes of suffering, in some cases leading to mammary abscess. Whenever the practitioner has the opportunity, he should advise his patient to prepare the nipple for nursing in the latter months of pregnancy; and this may best be done by daily bathing it with a spirituous or astringent lotion, such

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[1] Routh on *Infant-feeding.*

as eau de Cologne and water, or a weak solution of tannin. After nursing has begun, great care should be taken to wash and dry the nipple after the child has been applied to it, and, as long as the mother is in the recumbent position, she may, if the nipples be at all tender, use zinc nipple-shields with advantage, when she is not nursing. In this way these troublesome complications may generally be prevented. The most common forms are either an abrasion on the surface of the nipple, which, if neglected, may form a small ulcer, or a crack at some part of the nipple, most generally at its base. In either case, the suffering when the child is put to the breast is intense, sometimes indeed amounting to intolerable anguish, causing the mother to look forward with dread to the application of the child. Whenever such pain is complained of, the nipple should be carefully examined, since the fissure or sore is often so minute as to escape superficial examination. The remedies recommended are very numerous and not always successful. Amongst those most commonly used are astringent applications, such as tannin, or weak solutions of nitrate of silver, or cauterising the edges of the fissure with solid nitrate of silver, or applying the flexible collodion of the Pharmacopoeia. Dr. Wilson, of Glasgow, speaks highly of a lotion composed of ten grains of nitrate of lead in an ounce of glycerine, which is to be applied after suckling, the nipple being carefully washed before the child is again put to the breast. I have myself found nothing answer so well as a lotion composed of half an ounce of sulphurous acid, half an ounce of the glycerine of tannin, and an ounce of water, the beneficial effects of which are sometimes quite remarkable. Relief may occasionally be obtained by inducing the child to suck through a nipple-shield, especially when there is only an excoriation ; but this will not always answer, on account of the extreme pain which it produces.

An excessive flow of milk, known as *galactorrhoea*, often interferes with successful lactation. It is by no means rare in the first weeks after delivery for women of delicate constitution, who are really unfit to nurse, to be flooded with a superabundance of watery and innutritious milk, which soon produces disordered digestion in the child. Under such circumstances, the only thing to be done is to give up an

<div style="float:right">Excessive flow of milk.</div>

attempt which is injurious both to the mother and child. At a later stage the milk, secreted in large quantities, is sufficiently nourishing to the child, but the drain on the mother's **Its effect on the mother.** constitution soon begins to tell on her. Palpitation, giddiness, emaciation, headache, loss of sleep, spots before the eyes, indicate the serious effects which are being produced, and the absolute necessity of at once stopping lactation. Whenever, therefore, a nursing woman suffers from such symptoms, it is far better at once to remove the cause, otherwise a very serious and permanent deterioration of health might result. When, under such circumstances, nursing is unwisely persevered in, most serious results may follow. Should any diathetic tendency exist, especially when there is a predisposition to phthisis, nothing is so likely to develop it as the debility produced by excessive lactation. Certain diseases of the eye are then specially apt to occur, such as severe inflammation of the cornea, leading to opacity and even sloughing, and certain forms of choroiditis; also impairment of accommodation due to defective power of the ciliary muscle.[1]

Mammary abscess. There is no more troublesome complication of lactation than the formation of abscess in the breast; an occurrence by no means rare, and which, if improperly treated, may, by long-continued suppuration and the formation of numerous sinuses in and about the breast, produce very serious effects on the general health. The causes of breast abscesses are numerous, and very trivial circumstances may occasionally set up inflammation, ending in suppuration. Thus it may follow exposure to cold; a blow, or other injury to the breast; some temporary engorgement of the lacteal tubes; or even sudden or depressing mental emotions. The most frequent cause is irritation from fissures or erosions of the nipples, which must, therefore, always be regarded with suspicion, and cured as soon as possible.

Signs and symptoms. The abscess may form in any part of the breast, or in the areolar tissue below it; in the latter case, the inflammation very generally extends to the gland-structure. Abscess is usually ushered in by constitutional symptoms, varying in

[1] See Foerster of Breslau in Graefe and Saemisch's *Handbuch des Gesammten Augenheilkunde*, and Power on 'The Diseases of the Eye in connection with Pregnancy,' *Lancet*, May 8, 1880, *et seq.*

severity with the amount of the inflammation. Pyrexia is always present; elevated temperature, rapid pulse, and much malaise and sense of feverishness, followed, in many cases, by distinct rigor, when deep-seated suppuration is taking place. On examining the breast it will be found to be generally enlarged and very tender, while at the site of the abscess an indurated and painful swelling may be felt. If the inflammation be chiefly limited to the subglandular areolar tissue, there may be no localised swelling felt, but the whole breast will be acutely sensitive, and the slightest movement will cause much pain. As the case progresses, the abscess becomes more and more superficial, the skin covering it is red and glazed, and if left to itself it bursts. In the more serious cases, it is by no means rare for multiple abscesses to form. These opening, one after the other, lead to the formation of numerous fistulous tracts, by which the breast may become completely riddled. Sloughing of portions of the gland-tissue may take place, and even considerable hæmorrhage, from the destruction of blood-vessels. The general health soon suffers to a marked degree, and, as the sinuses continue to suppurate for many successive months, it is by no means uncommon for the patient to be reduced to a state of profound and even dangerous debility.

Much may be done by proper care to prevent the forma- Treat ment. tion of abscess, especially by removing engorgement of the lacteal ducts, when threatened, by gentle hand-friction in the manner already indicated. When the general symptoms, and the local tenderness, indicate that inflammation has commenced, we should at once endeavour to moderate it, in the hope that resolution may occur without the formation of pus. Here general principles must be attended to, especially giving the affected part as much rest as possible. Feverishness may be combated by gentle salines, minute doses of aconite, and large doses of quinine; while pain should be relieved by opiates. The patient should be strictly confined in bed, and the affected breast supported by a suspensory bandage. Warmth and moisture are the best means of relieving the local pain, either in the form of hot fomentations or of light poultices of linseed-meal or bread and milk, and the breast may be smeared with extract of belladonna rubbed down with glycerine, or the belladonna liniment

sprinkled over the surface of the poultices. The local appli-
cation of ice in india-rubber bags has been highly extolled as
a means of relieving the pain and tension, and is said to be
much more effectual than heat and moisture.[1]   Generally
the pain and irritation produced by putting the child to the
breast are so great as to contra-indicate nursing from the
affected side altogether, and we must trust to relieving the
tension by poultices ; suckling being, in the meantime,
carried on by the other breast alone.   In favourable cases
this is quite possible for a time, and it may be that, if the
inflammation do not end in suppuration, or if the abscess be
small and localised, the affected breast is again able to re-
sume its functions.   Often this is not possible, and it may
be advisable, in severe cases, to give up nursing altogether.

Pus
should be
removed
as soon as
possible.

    The subsequent management of the case consists in the
opening of the abscess as soon as the existence of pus is
ascertained, either by fluctuation, or, if the site of the abscess
be deep-seated, by the exploring needle.   It may be laid
down as a principle, that the sooner the pus is evacuated the
better, and nothing is to be gained by waiting until it is
superficial.   On the contrary, such delay only leads to more
extensive disorganisation of tissue and the further spread of
inflammation.

Antiseptic
treatment
of mam-
mary ab-
scess.

    The method of opening the abscess is of primary im-
portance.   It has always been customary simply to open the
abscess at its most dependent part, without using any pre-
caution against the admission of air, and afterwards to treat
secondary abscesses in the same way.   The results are well
known to all practical accoucheurs, and the records of surgery
fully show how many weeks or months generally elapse in
bad cases before recovery is complete.   The antiseptic treat-
ment of mammary abscess, in the way first pointed out by
Lister, affords results which are of the most remarkable
and satisfactory kind.   Instead of being weeks and months
in healing, I believe that the practitioner who fairly and
minutely carries out Sir Joseph Lister's directions may con-
fidently look for complete closure of the abscess in a few
days; and I know nothing, in the whole range of my pro-
fessional experience, that has given me more satisfaction than
the application of this method to abscesses of the breast.

[1] Corson, *Amer. Journ. of Obstet.*, Jan. 1881.

CHAP. II.] MANAGEMENT OF THE INFANT, LACTATION, ETC. 297

The plan I first used is that recommended by Lister in the 'Lancet' for 1867, but which is now superseded by his improved methods, which, of course, will be used in preference by all who have made themselves familiar with the details of antiseptic surgery. The former, however, is easily within the reach of everyone, and is so simple that no special skill or practice is required in its application; whereas the more perfected antiseptic appliances will probably not be so readily obtained, and are much more difficult to use. I, therefore, insert Sir Joseph Lister's original directions, which he assures me are perfectly antiseptic, for the guidance of those who may not be able to obtain the more elaborate dressings :—' A solution of one part of crystallised carbolic acid in four parts of boiled linseed oil having been prepared, a piece of rag from four to six inches square is dipped into the oily mixture, and laid upon the skin where the incision is to be made. The lower edge of the rag being then raised, while the upper edge is kept from slipping by an assistant, a common scalpel or bistoury dipped in the oil is plunged into the cavity of the abscess, and an opening about three-quarters of an inch in length is made, and the instant the knife is withdrawn the rag is dropped upon the skin as an antiseptic curtain, beneath which the pus flows out into a vessel placed to receive it. The cavity of the abscess is firmly pressed, so as to force out all existing pus as nearly as may be (the old fear of doing mischief by rough treatment of the pyogenic membrane being quite ill-founded); and if there be much oozing of blood, or if there be considerable thickness of parts between the abscess and the surface, a piece of lint dipped in the antiseptic oil is introduced into the incision to check bleeding and prevent primary adhesion, which is otherwise very apt to occur. The introduction of the lint is effected as rapidly as may be, and under the protection of the antiseptic rag. Thus the evacuation of the original contents is accomplished with perfect security against the introduction of living germs. This, however, would be of no avail unless an antiseptic dressing could be applied that would effectually prevent the decomposition of the stream of pus constantly flowing out beneath it. After numerous disappointments, I have succeeded with the following, which may be relied upon as absolutely trustworthy : About six teaspoonfuls of the

above-mentioned solution of carbolic acid in linseed oil are mixed up with common whiting (carbonate of lime) to the consistence of a firm paste, which is, in fact, glazier's putty with the addition of a little carbolic acid. This is spread upon a piece of common tin-foil about six inches square, so as to form a layer about a quarter of an inch thick. The tin-foil, thus spread with putty, is placed upon the skin, so that the middle of it corresponds to the position of the incision, the antiseptic rag used in opening the abscess being removed the instant before. The tin is then fixed securely by adhesive plaster, the lowest edge being left free for the escape of the discharge into a folded towel placed over it and secured by a bandage. The dressing is changed, as a general rule, once in 24 hours, but, if the abscess be a very large one, it is prudent to see the patient 12 hours after it has been opened, when, if the towel should be much stained with discharge, the dressing should be changed, to avoid subjecting its antiseptic virtues to too severe a test. But after the first 24 hours a single daily dressing is sufficient. The changing of the dressing must be methodically done as follows : A second similar piece of tin-foil having been spread with the putty, a piece of rag is dipped in the oily solution and placed on the incision the moment the first tin is removed. This guards against the possibility of mischief occurring during the cleansing of the skin with a dry cloth, and pressing out any discharge which may exist in the cavity. If a plug of lint was introduced when the abscess was opened, it is removed under cover of the antiseptic rag, which is taken off at the moment when the new tin is to be applied. The same process is continued daily until the sinus closes.'

Treatment of long-continued suppuration and fever.

If the case come under our care when the abscess has been long discharging, or when sinuses have formed, the treatment is directed mainly to procuring a cessation of suppuration and closure of the sinuses. For this purpose methodical strapping of the breast with adhesive plaster, so as to afford steady support and compress the composing pyogenic surfaces, will give the best results. It may be necessary to lay open some of the sinuses, or to inject tinct. iodi or other stimulating lotions, so as to moderate the discharge, the subsequent surgical treatment varying according to the

requirements of each case. In such neglected cases Billroth recommends that, after the patient has been anæsthetised, the openings should be dilated so as to admit the finger, by which the septa between the various sinuses should be broken down, and a large single abscess-cavity made. This should then be thoroughly irrigated with a three per cent. solution of carbolic acid, a drainage-tube introduced, and the ordinary antiseptic dressings applied. As the drain on the system is great, and the constitutional debility generally pronounced, much attention must be paid to general treatment; and abundance of nourishing food, appropriate stimulants, and such medicines as iron and quinine, will be indicated.

In a considerable number of cases the inability of the mother to nurse the child, her invincible repugnance to a wet nurse, or inability to bear the expense, renders hand-feeding essential. It is, therefore, of importance that the accoucheur should be thoroughly familiar with the best method of bringing up the child by hand, so as to be able to direct the process in the way that is most likely to be successful. *Hand-feeding.*

Much of the mortality following hand-feeding may be traced to unsuitable food. Among the poorer classes especially there is a prevalent notion that milk alone is insufficient; and hence the almost universal custom of administering various farinaceous foods, such as corn-flour or arrowroot, even from the earliest period. Many of these consist of starch alone, and are therefore absolutely unsuited for forming the staple of diet, on account of the total absence of nitrogenised elements. Independently of this, it has been shown that the saliva of infants has not the same digestive property on starch that it subsequently acquires, and this affords a further explanation of its so constantly producing intestinal derangement. Reason, as well as experience, abundantly prove that the object to be aimed at in hand-feeding is to imitate as nearly as possible the food which nature supplies for the new-born child, and therefore the obvious course is to use milk from some animal, so treated as to make it resemble human milk as nearly as may be. *Causes of mortality in hand-fed children. Milk alone should be used at first.*

Of the various milks used, that of the ass, on the whole, most closely resembles human milk, containing less casein and butter, and more saline ingredients. It is not always easy *Ass's milk.*

to obtain, and in towns it is excessively expensive. More-over, it does not always agree with the child, being apt to produce diarrhœa. We can, however, be more certain of its being unadulterated, which in large cities is in itself no small advantage, and it may be given without the addition of water or sugar.

Goat's milk.

Goat's milk in this country is still more difficult to ob-tain, but it often succeeds admirably. In many places the infant sucks the teat directly, and certainly thrives well on this plan.

Cow's milk and its prepa-ration.

In a large majority of cases we have to rely on cow's milk alone. It differs from human milk in containing less water, a larger amount of casein and solid matters, and less sugar. Therefore, before being given, it requires to be diluted and sweetened. A common mistake is over-dilution, and it is far from rare for nurses to administer one-third cow's milk to two-thirds water. The result of this excessive dilution is, that the child becomes pale and puny, and has none of the firm and plump appearance of a well-fed infant. The practitioner should, therefore, ascertain that this mistake is not being made; and the necessary dilution will be best obtained by adding to pure fresh cow's milk one-third hot water, so as to warm the mixture to about 96°, the whole being slightly sweetened with sugar of milk, or ordinary crystallised sugar. After the first two or three months the amount of water may be lessened, and pure milk, warmed and sweetened, given instead. Whenever it is possible, the milk should be obtained from the same cow, and in towns some care is requisite to see that the animal is properly fed and stabled. Of late years it has been customary to obviate the difficulties of obtaining good fresh milk by using some of the tinned milks now so easily to be had. These are already sweetened, and sometimes answer well, if not given in too weak a dilution. One great drawback in bottle-feeding is the tendency of the milk to become acid, and hence to produce diarrhœa. This may be obviated to a great extent by adding a tablespoonful of lime-water to each bottle, instead of an equal quantity of water.

Artificial human milk.

An admirable plan of treating cow's milk, so as to reduce it to almost absolute chemical identity with human milk, has been devised by Professor Frankland, to whom I am

indebted for permission to insert the recipe. I have followed this method in many cases, and find it far superior to the usual one, as it produces an exact and uniform compound. With a little practice nurses can employ it with no more trouble than the ordinary mixing of cow's milk with water and sugar. The following extract from Dr. Frankland's work[1] will explain the principles on which the preparation of the artificial human milk is founded : ' The rearing of infants who cannot be supplied with their natural food is notoriously difficult and uncertain, owing chiefly to the great difference in the chemical composition of human milk and cow's milk. The latter is much richer in casein and poorer in milk-sugar than the former, whilst asses' milk, which is sometimes used for feeding infants, is too poor in casein and butter, although the proportion of sugar is nearly the same as in human milk. The relations of the three kinds of milk to each other are clearly seen from the following analytical numbers, which express the percentage amounts of the different constituents :—

	Woman.	Ass.	Cow.
Casein	2·7	1·7	4·2
Butter	3·5	1·3	3·8
Milk-sugar	5·0	4·5	3·8
Salts	·2	·5	·7

These numbers show that by the removal of one-third of the casein from cow's milk, and the addition of about one-third more milk-sugar, a liquid is obtained which closely approaches human milk in composition, the percentage amounts of the four chief constituents being as follows :—

Casein	2·8
Butter	3·8
Milk-sugar	5·0
Salts	·7

The following is the mode of preparing the milk : Allow one-third of a pint of new milk to stand for about twelve hours, remove the cream, and add to it two-thirds of a pint of new milk, as fresh from the cow as possible. Into the one-third of a pint of blue milk left after the abstraction of the cream put a piece of rennet about one inch square. Set the vessel in warm water until the milk is fully curdled, an operation

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[1] Frankland's *Experimental Researches in Chemistry*, p. 843.

requiring from five to fifteen minutes according to the activity of the rennet, which should be removed as soon as the curdling commences, and put into an egg-cup for use on subsequent occasions, as it may be employed daily for a month or two. Break up the curd repeatedly, and carefully separate the whole of the whey, which should then be rapidly heated to boiling in a small tin pan placed over a spirit or gas lamp. During the heating a further quantity of casein, technically called 'fleetings,' separates, and must be removed by straining through muslin. Now dissolve 110 grains of powdered sugar of milk in the hot whey, and mix it with the two-thirds of a pint of new milk to which the cream from the other third of a pint was added as already described. The artificial milk should be used within twelve hours of its preparation, and it is almost needless to add that all the vessels employed in its manufacture and administration should be kept scrupulously clean.' [1]

Method of hand-feeding.

Much of the success of bottle-feeding must depend on minute care and scrupulous cleanliness, points which cannot be too strongly insisted on. Particular attention should be paid to preparing the food fresh for every meal, and to keeping the feeding-bottle and tubes constantly in water when not in use, so that minute particles of milk may not remain about them and become sour. A neglect of this is one of the most fertile sources of the thrush from which bottle-fed infants often suffer. The particular form of bottle used is not of much consequence. Those now commonly employed,

[1] The following recipe yields the same results, but the method is easier, and I find that nurses prepare the milk with less difficulty when it is followed : ' Take half a pint of skimmed milk, heat it to about 96°, and put into the warmed milk a piece of rennet about an inch square. Set the milk to stand in the fender or over a lamp until it is quite warm. When it is set, take the rennet out, and break up the curd quite small with a knife, and let it stand ten or fifteen minutes, when the curd will sink. Then pour the whey into a saucepan, and let it boil quickly. Measure one-third of a pint of this whey, and dissolve in it, when hot, a powder containing 110 grains of sugar of milk. *When this third of a pint of whey is quite cold*, add to it two-thirds of a pint of new milk and two teaspoonfuls of cream, stirring the whole together. The food should be made fresh every twelve hours, and warmed as required. The piece of rennet when taken out can be kept in an egg-cup, and used for ten days or a fortnight.'—N.B. It is often advisable during the first month to use rather more than a third of a pint of whey, as the milk is apt to be rather too rich for a newly-born child.

with a long india-rubber tube attached, are preferable to the older forms of flat bottle, as they necessitate strong suction on the part of the infant, thus forcing it to swallow the food more slowly. Care must be taken to give the meals at stated periods, as in breast-feeding, and these should be at first about two hours apart, the intervals being gradually extended. The nurse should be strictly cautioned against the common practice of placing the bottle beside the infant in its cradle, and allowing it to suck to repletion, a practice which leads to over-distention of the stomach, and consequent dyspepsia. The child should be raised in the arms at the proper time, have its food administered, and then be replaced in the cradle to sleep. In the first few weeks of bottle-feeding constipation is very common, and may be effectually remedied by placing as much phosphate of soda as will lie on a threepenny-piece in the bottle, two or three times in the twenty-four hours.

If this system succeed, no other food should be given until the child is six or seven months old, and then some of the various infants' foods may be cautiously commenced. Of these there are an immense number in common use; some of which are good articles of diet, others are unfitted for infants. In selecting them we have to see that they contain the essential elements of nutrition in proper combination. All those, therefore, that are purely starchy in character, such as arrowroot, corn-flour, and the like, should be avoided; while those that contain nitrogenous as well as starch elements, may be safely given. Of the latter the entire wheat-flour, which contains the husks ground down with the wheat, generally answers admirably; and of the same character are rusks, tops and bottoms, Nestlé's or Liebig's infant's food, and many others. If the child be pale and flabby, some more purely animal food may often be given twice a day, and great benefit may be derived from a single meal of beef, chicken, or veal tea, with a little bread crumb in it, especially after the sixth or seventh month. Milk, however, should still form the main article of diet, and should continue to do so for many months. *Other kinds of food.*

If the child be pale, flabby, and do not gain flesh, more especially if diarrhœa or other intestinal disturbance be present, we may be certain that hand-feeding is not answering *Management when milk disagrees.*

satisfactorily, and that some change is required. If the child be not too old, and will still take the breast, that is certainly the best remedy, but if that be not possible, it is necessary to alter the diet. When milk disagrees, cream, in the proportion of one tablespoonful to three of water, sometimes answers as well. Occasionally also Liebig's or Mellin's infant's food, when carefully prepared, renders good service. Too often, however, when once diarrhœa or other intestinal disturbance has set in, all our efforts may prove unavailing, and the health, if not the life, of the infant becomes seriously imperilled. It is not, however, within the scope of this work to treat of the disorders of infants at the breast, the proper consideration of which requires a large amount of space, and I therefore refrain from making any further remarks on the subject.

CHAPTER III.

PUERPERAL ECLAMPSIA.

By the term *puerperal eclampsia* is meant a peculiar kind of epileptiform convulsions, which may occur in the latter months of pregnancy, or during, or after parturition, and it constitutes one of the most formidable diseases with which the obstetrician has to cope. The attack is often so sudden and unexpected, so terrible in its nature, and attended with such serious danger both to the mother and child, that the disease has attracted much attention. *Puerperal eclampsia.*

The researches of Lever, Braun, Frerichs, and many other writers who have shown the frequent association of eclampsia with albuminuria, have, of late years, been supposed to clear up to a great extent the etiology of the disease, and to prove its dependence on the retention of urinary elements in the blood. While the urinary origin of eclampsia has been pretty generally accepted, more recent observations have tended to throw doubt on its essential dependence on this cause; so that it can hardly be said that we are yet in a position to explain its true pathology with certainty. These points will require separate discussion, but it is first necessary to describe the character and history of the attack. *Its doubtful etiology.*

Considerable confusion exists in the description of puerperal convulsions from the confounding of several essentially distinct diseases under the same name. Thus, in most obstetric works, it has been customary to describe three distinct classes of convulsion; the *epileptic*, the *hysterical*, and the *apoplectic*. The two latter, however, come under a totally different category. A pregnant woman may suffer from hysterical paroxysms, or she may be attacked with apoplexy, accompanied with coma, and followed by paralysis. But these conditions in the pregnant or parturient woman *Confusion from including distinct diseases under the same name.*

are identical with the same diseases in the non-pregnant, and are in no way special in their nature. True eclampsia, however, is different in its clinical history from epilepsy ; although the paroxysms, while they last, are essentially the same as those of an ordinary epileptic fit.

Premonitory symptoms. An attack of eclampsia seldom occurs without having been preceded by certain more or less well-marked precursory symptoms. It is true that in a considerable number of cases these are so slight as not to attract attention, and suspicion is not aroused until the patient is seized with convulsions. Still subsequent investigations will very generally show that some symptoms did exist, which if observed and properly interpreted might have put the practitioner on his guard, and possibly have enabled him to ward off the attack. Hence a knowledge of them is of real practical value. The most common are associated with the cerebrum, such as severe headache, which is the one most generally observed, and is sometimes limited to one side of the head. Transient attacks of dizziness, spots before the eyes, loss of sight, or impairment of the intellectual faculties, are also not uncommon. These signs in a pregnant woman are of the gravest import, and should at once call for investigation into the nature of the case. Less-marked indications sometimes exist in the form of irritability, slight headache or stupor, and a general feeling of indisposition. Another important premonitory sign is œdema of the subcutaneous cellular tissue, especially of the face or upper extremities, which should at once lead to an examination of the urine.

Symptoms of the attack. Whether such indications have preceded an attack, or not, as soon as the convulsion comes on there can no longer be any doubt as to the nature of the case. The attack is generally sudden in its onset, and in its character is precisely that of a severe epileptic fit, or of the convulsions in children.

There is first a tonic convulsion almost immediately succeeded by clonic spasms. Close observation shows that there is at first a short period of tonic spasm, affecting the entire muscular system. This is almost immediately succeeded by violent clonic contractions, generally commencing in the muscles of the face, which twitch violently ; the expression is horribly altered, the globes of the eyes are turned up under the eyelids, so as to leave only the white sclerotics visible, and the angles of the mouth are retracted and fixed in a convulsive grin. The

tongue is at the same time protruded forcibly, and, if care be not taken, is apt to be lacerated by the violent grinding of the teeth. The face, at first pale, soon becomes livid and cyanosed, while the veins of the neck are distended, and the carotids beat vigorously. Frothy saliva collects about the mouth, and the whole appearance is so changed as to render the patient quite unrecognisable. The convulsive movements soon attack the muscles of the body. The hands and arms, at first rigidly fixed, with the thumbs clenched into the palms, begin to jerk, and the whole muscular system is thrown into rapidly recurring convulsive spasms. It is evident that the involuntary muscles are implicated in the convulsive action as well as the voluntary. This is shown by a temporary arrest of respiration at the commencement of the attack, followed by irregular and hurried respiratory movements producing a peculiar hissing sound. The occasional involuntary expulsion of urine and fæces indicates the same fact. During the attack the patient is absolutely unconscious, sensibility is totally suspended, and she has afterwards no recollection of what has taken place. Fortunately the convulsion is not of long duration, and, at the outside, does not last more than three or four minutes, generally not so long, and it has been pointed out that a longer paroxysm would almost necessarily prove fatal on account of the implication of the respiratory muscles. In most cases, after an interval, there is a recurrence of the convulsion, characterised by the same phenomena, and the paroxysms are repeated with more or less force and frequency according to the severity of the attack. Sometimes several hours may elapse before a second convulsion comes on ; at others the attacks may recur very often, with only a few minutes between them. In the slighter forms of eclampsia there may not be more than 2 or 3 paroxysms in all; in the more serious as many as 50 or 60 have been recorded.

The paroxysms recur with varying frequency.

After the first attack the patient generally soon recovers her consciousness, being somewhat dazed and somnolent, with no clear conception of what has occurred. If the paroxysms be frequently repeated, more or less profound coma continues in the intervals between them, which, no doubt, depends upon intense cerebral congestion, resulting from the interference with the circulation in the great veins

Condition between the attacks.

of the neck, produced by spasmodic contraction of the muscles. The coma is rarely complete, the patient showing signs of sensibility when irritated, and groaning during the uterine contractions. In the worst class of cases, the torpor may become intense and continuous, and in this state the patient may die. When the convulsions have entirely stopped, and the patient has completely regained her consciousness, and is apparently convalescent, recollection of what has taken place during, and some time before, the attack, may be entirely lost, and this condition may last for a considerable time. A curious instance of this once came under my notice in a lady who had lost her brother, to whom she was greatly attached, in the week immediately preceding her confinement, and in whom the mental distress seemed to have had a great deal to do in determining the attack. It was many weeks before she recovered her memory, and during that time she recollected nothing about the circumstances connected with her brother's death, the whole of that week being, as it were, blotted out of her recollection.

Relation of the attacks to labour. If the convulsions come on during pregnancy, we may look upon the advent of labour as almost a certainty; and if we consider the severe nervous shock and general disturbance, this is the result we might reasonably anticipate. If they occur, as is not uncommon, for the first time during labour, the pains generally continue with increased force and frequency, since the uterus partakes of the convulsive action. It has not rarely happened that the pains have gone on with such intensity that the child has been born quite unexpectedly, the attention of the practitioner being taken up with the patient. In many cases the advent of fresh paroxysms is associated with the commencement of a pain, the irritation of which seems sufficient to bring on the convulsion.

Results to the mother and child. The results of eclampsia vary according to the severity of the paroxysms. It is generally said that about 1 in 3 or 4 cases dies. The mortality has certainly lessened of late years, probably in consequence of improved knowledge of the nature of the disease, and more rational modes of treatment. This is well shown by Barker,[1] who found in 1885 a mortality of 32 per cent. in cases occurring before and during

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[1] *The Puerperal Diseases*, p. 125.

labour, and 22 per cent. in those after labour; while since
that date the mortality has fallen to 14 per cent. The same
conclusion is arrived at by Dr. Phillips,[1] who has shown
that the mortality has greatly lessened since the practice of
repeated and indiscriminate bleeding, long considered the
sheet anchor in the disease, has been discontinued, and the
administration of chloroform substituted.

Death may occur during the paroxysm, and then it may *Cause of*
be due to the long continuance of the tonic spasm producing *death.*
asphyxia. It is certain that, as long as the tonic spasm lasts,
the respiration is suspended, just as in the convulsive disease
of children known as laryngismus stridulus; and it is possible
also that the heart may share in the convulsive contraction
which is known to affect other involuntary muscles. More
frequently, death happens at a later period, from the com-
bined effects of exhaustion and asphyxia. The records of
post-mortem examinations are not numerous; in those we
possess, the principal changes have been an anæmic condi-
tion of the brain, with some œdematous infiltration. In a
few rare cases the convulsions have resulted in effusion of
blood into the ventricles, or at the base of the brain. The
prognosis as regards the child is also serious. Out of 36
children, Hall Davis found 26 born alive, 10 being still-
born. There is good reason to believe that the convulsion
may attack the child *in utero*; of this several examples
are mentioned by Cazeaux; or it may be subsequently at-
tacked with convulsions, even when apparently healthy at
birth.

The precise pathology of eclampsia cannot be considered *Pathology*
by any means satisfactorily settled. When, in the year *of the*
1843, Lever first showed that the urine in patients suffer- *disease.*
ing from puerperal convulsions was generally highly charged *Uræmic*
with albumen—a fact which subsequent experience has amply *theory of*
confirmed—it was thought that a key to the etiology of the *its origin.*
disease had been found. It was known that chronic forms of
Bright's disease were frequently associated with retention of
urinary elements in the blood, and not rarely accompanied
by convulsions. The natural inference was drawn, that the
convulsions of eclampsia were also due to toxæmia resulting
from the retention of urea in the blood, just as in the uræmia

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[1] *Guy's Hospital Reports*, 1870.

of chronic Bright's disease ; and this view was adopted and supported by the authority of Braun, Frerichs, and many other writers of eminence, and was pretty generally received as a satisfactory explanation of the facts. Frerichs modified it so far, that he held that the true toxic element was not urea as such, but carbonate of ammonia, resulting from its decomposition ; and experiments were made to prove that the injection of this substance into the veins of the lower animals produced convulsions of precisely the same character as eclampsia. Dr. Hammond,[1] of Maryland, subsequently made a series of counter experiments, which were held as proving that there was no reason to believe that urea ever did become decomposed in the blood in the way that Frerichs supposed, or that the symptoms of uræmia were ever produced in this way. Others have believed that the poisonous elements retained in the blood are not urea or the products of its decomposition, but other extractive matters which have escaped detection. As time elapsed, evidence accumulated to show that the relation between albuminuria and eclampsia was not so universal as was supposed, or at least that some other factors were necessary to explain many of the cases. Numerous cases were observed in which albumen was detected in large quantities, without any convulsion following, and that, not only in women who had been the subject of Bright's disease before conception, but also when the albuminuria was known to have developed during pregnancy. Thus Imbert Goubeyre found that out of 164 cases of the latter kind, 95 had no eclampsia ; and Blot, out of 41 cases, found that 34 were delivered without untoward symptoms. It may be taken as proved, therefore, that albuminuria is by no means necessarily accompanied by eclampsia. Cases were also observed in which the albumen only appeared after the convulsion ; and in these it was evident that the retention of urinary elements could not have been the cause of the attack ; and it is highly probable that in them the albuminuria was produced by the same cause which induced the convulsion. Special attention has been called to this class of cases by Braxton Hicks,[2] who has recorded a considerable number of them. He says that the nearly simultaneous appearance of albuminuria and convulsion—and it is admitted

Some cases, however, cannot be explained this way.

Cases in which the convulsion precedes the albuminuria.

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[1] *Amer. Journ. of Med. Sc.*, 1861.   [2] *Obstet. Trans.* vol. viii.

that the two are almost invariably combined—must then be explained in one of three ways.

1st. That the convulsions are the cause of the nephritis.

2ndly. That the convulsions and the nephritis are produced by the same cause, e.g., some detrimental ingredient circulating in the blood, irritating both the cerebro-spinal system and other organs at the same time.

3rdly. That the highly congested state of the venous system, induced by the spasm of the glottis in eclampsia, is able to produce the kidney complication.

More recently Traübe and Rosenstein have advanced a theory of eclampsia, purporting to explain these anomalies. They refer the occurrence of eclampsia to acute cerebral anæmia, resulting from changes in the blood incident to pregnancy. The primary factor is the hydræmic condition of the blood, which is an ordinary concomitant of the pregnancy state, and, of course, when there is also albuminuria, the watery condition of the blood is greatly intensified; hence the frequent association of the two states. Accompanying this condition of the blood, there is increased tension of the arterial system, which is favoured by the hypertrophy of the heart which is known to be a normal occurrence in pregnancy. The result of these combined states is a temporary hyperæmia of the brain, which is rapidly succeeded by serous effusion into the cerebral tissues, resulting in pressure on its minute vessels, and consequent anæmia. There is much in this theory that accords with the most recent views as to the etiology of convulsive disease; as, for example, the researches of Kussmaul and Tenner, who had experimentally proved the dependence of convulsion on cerebral anæmia, and of Brown-Séquard, who showed that an anæmic condition of the nerve-centres preceded an epileptic attack. It explains also very satisfactorily how the occurrence of labour should intensify the convulsions, since, during the acme of the pains, the tension of the cerebral arterial system is necessarily greatly increased. There are, however, obvious difficulties against its general acceptance. For example, it does not satisfactorily account for those cases which are preceded by well-marked precursory symptoms, and in which an abundance of albumen is present in the urine. Here the premonitory signs are precisely those

which precede the development of uræmia in chronic Bright's disease, the dependence of which on the retention in the blood of urinary elements can hardly be doubted. Moreover, it has been shown by Lohlein and others that on post-mortem examination the brain does not, as a rule, exhibit the œdema, anæmia, and flattened convolutions which this theory assumes.

Views of Mac-Donald.

MacDonald [1] has published an interesting paper on this subject, in which he describes two very careful post-mortem examinations. In these he found extreme anæmia of the cerebro-spinal centres, with congestion of the meninges, but no evidence of œdema. He inclines to the belief that eclampsia is caused by irritation of the vaso-motor centre in consequence of an anæmic condition of the blood, produced by the retention in it of excrementitious matters which the kidneys ought to have removed, this over-stimulation resulting in anæmia of the deeper-seated nerve-centres and consequent convulsion.

Excitability of nervous system in puerperal women as predisposing to convulsions.

The key to the liability of the puerperal woman to convulsive attacks is, no doubt, to be found in the peculiar excitable condition of the nervous system in pregnancy—a fact which was clearly pointed out by the late Dr. Tyler Smith, and by many other writers. Her nervous system is, in this respect, not unlike that of children, in whom the predominant influence and great excitability of the nervous system are well-established facts, and in whom precisely similar convulsive seizures are of common occurrence on the application of a sufficiently exciting cause.

Exciting causes.

Admitting this, we require some cause to set the predisposed nervous system into morbid action, and this we may have either in a toxæmic, or in an extremely watery, condition of the blood, associated with albuminuria ; or along with these, or sometimes independently of them, in some excitement, such as strong emotional disturbance. It is highly probable, however, that extreme anæmia is one of the actual conditions of the nerve-centres—a fact of much practical importance in reference to treatment.

Treatment.

The management of cases in which the occurrence of suspicious symptoms has led to the detection of albuminuria,

[1] See his volume of Collected Essays, entitled *Heart Disease during Pregnancy*, London, 1878.

has already been fully discussed (vol. i. p. 234). We shall, therefore, here only consider the treatment of cases in which convulsions have actually occurred.

Until quite recently venesection was regarded as the sheet anchor in the treatment, and blood was always removed copiously, and, there is sufficient reason to believe, with occasional remarkable benefit. Many cases are recorded in which a patient, in apparently profound coma, rapidly regained her consciousness when blood was extracted in sufficient quantity. The improvement, however, was often transient, the convulsions subsequently recurring with increased vigour. There are good theoretical grounds for believing that blood-letting can only be of merely temporary use, and may even increase the tendency to convulsion. These are so well put by Schroeder, that I cannot do better than quote his observations on this point: ' If,' he says, ' the theory of Traübe and Rosenstein be correct, a sudden depletion of the vascular system, by which the pressure is diminished, must stop the attacks. From experience it is known that after venesection the quantity of blood soon becomes the same through the serum taken from all the tissues, while the quality is greatly deteriorated by the abstraction of blood. A short time after venesection we shall expect to find the former blood-pressure in the arterial system, but the blood far more watery than previously. From this theoretical consideration, it follows that abstraction of blood, if the above-mentioned conditions really cause convulsions, must be attended by an immediate favourable result, and, under certain circumstances, the whole disease may surely be cut short by it. But, if all other conditions remain the same, the blood-pressure will after some time again reach its former height. The quality of blood has in the meantime been greatly deteriorated, and consequently the danger of the disease will be increased.'

These views sufficiently well explain the varying opinions held with regard to this remedy, and enable us to understand why, while the effects of venesection have been so lauded by certain authors, the mortality has admittedly been much lessened since its indiscriminate use has been abandoned. It does not follow because a remedy, when carried to excess, is apt to be hurtful, that it should be discarded altogether; and

Venesection.

Theoretical objections to venesection.

In properly selected cases venesection is a valuable remedy.

I have no doubt that, in properly-selected cases, and judiciously employed, venesection is a valuable aid in the treatment of eclampsia, and that it is specially likely to be useful in mitigating the first violence of the attack, and in giving time for other remedies to come into action. Care should, however, be taken to select the cases properly, and it will be specially indicated when there is marked evidence of great cerebral congestion and vascular tension, such as a livid face, a full bounding pulse, and strong pulsation in the carotids. The general constitution of the patient may also serve as a guide in determining its use, and we shall be the more disposed to resort to it if the patient be a strong and healthy woman; while, on the other hand, if she be feeble and weak, we may wisely discard it, and trust entirely to other means. In any case, it must be looked upon as a temporary expedient only; useful in warding off immediate danger to the cerebral tissues, but never as the main agent in treatment. Nor can it be permissible to bleed in the heroic manner frequently recommended. A single bleeding, the amount regulated by the effect produced, is all that is ever likely to be of service.

Compression of the carotids.

As a temporary expedient, having the same object in view, compression of the carotids during the paroxysms is worthy of trial. This was proposed by Trousseau in the eclampsia of infants, and, in the single case of eclampsia in which I have tried it, it seemed to be decidedly beneficial. It is a simple measure, and it offers the advantage of not leading to any permanent deterioration of the blood, as in venesection.

Administration of purgatives.

As a subsidiary means of diminishing vascular tension the administration of a strong purgative is desirable, and has the further effect of removing any irritant matter that may be lodged in the intestinal tract. If the patient be conscious a full dose of the compound jalap powder may be given, or a few grains of calomel combined with jalap; and if she be comatose, and unable to swallow, a drop of croton oil, or a quarter of a grain of elaterium, may be placed on the back of the tongue.

Administration of sedatives and narcotics.

The great indication in the management of eclampsia is the controlling of convulsive action by means of sedatives. Foremost amongst them must be placed the inhalation of chloroform, a remedy which is frequently remarkably useful,

and which has the advantage of being applicable at all stages
of the disease, and whether the patient be comatose or not.
Theoretical objections have been raised against its employ-
ment, as being likely to increase cerebral congestion ; of this
there is no satisfactory proof; on the contrary, there is reason
to think that chloroform inhalation has rather the effect of
lessening arterial tension, while it certainly controls the
violent muscular action by which the hyperæmia is so much
increased.   Practically no one who has used it can doubt its
great value in diminishing the force and frequency of the
convulsive paroxysms.   Statistically its usefulness is shown
by Charpentier, in his thesis on the effects of various methods
of treatment in eclampsia, since out of 63 cases in which it
was used, in 48 it had the effect of diminishing or arresting
the attacks, 1 only proving fatal.   The mode of administration   Mode of
has varied.   Some have given it almost continuously, keep-   adminis-
ing the patient in a more or less profound state of anæsthesia.   chloro-
Others have contented themselves with carefully watching   form.
the patient, and exhibiting the chloroform as soon as there
were any indications of a recurring paroxysm, with the view
of controlling its intensity.   The latter is the plan I have
myself adopted, and of the value of which, in most cases, I
have no doubt.   Every now and again cases will occur in
which chloroform inhalation is insufficient to control the
paroxysm, or in which, from the very cyanosed state of the
patient, its administration seems contra-indicated.   More-
over, it is advisable to have, if possible, some remedy more
continuous in its action, and requiring less constant personal
supervision.   Latterly the internal administration of chloral
has been recommended for this purpose.   My own experience
is decidedly in its favour, and I have used, as I believe, with
marked advantage, a combination of chloral with bromide of   Chloral
potassium, in the proportion of twenty grains of the former   and bro-
to half a drachm of the latter, repeated at intervals of from   potas-
four to six hours.   If the patient be unable to swallow, the   sium.
chloral may be given in an enema, or hypodermically, six
grains being diluted in ʒj. of water, and injected under the
skin.   The remarkable influence of bromide of potassium in
controlling the eclampsia of infants would seem to be an in-
dication for its use in puerperal cases.   Fordyce Barker is
opposed to the use of chloral, which he thinks excites instead

of lessening reflex irritability.[1] Another remedy, not entirely free from theoretical objections, but strongly recommended, **Subcutaneous injection of morphia.** is the subcutaneous injection of morphia, which has the advantage of being applicable when the patient is quite unable to swallow. It may be given in doses of one-third of a grain, repeated in a few hours, so as to keep the patient well under its influence. It is to be remembered that the object is to control muscular action, so as to prevent, as much as possible, the violent convulsive paroxysm, and, therefore, **Rationale of these remedies.** it is necessary that the narcosis, however produced, should be continuous. It is rational, therefore, to combine the intermittent action of chloroform with the more continuous action of other remedies, so that the former should supplement the latter when insufficient. Inhalation of the nitrite of amyl has been recommended on physiological grounds as likely to be useful, and is well worthy of trial, but of its action I have, as yet, no personal experience. Pilocarpin has recently been tried in the hope that the diaphoresis and salivation it produces might diminish arterial tension and free the blood of toxic matters. Braun[2] administered 3 centigrammes of the muriate of pilocarpin hypodermically, and reports favourably of the result; Fordyce Barker,[3] however, is of opinion that it produces so much depression as to be dangerous.

Other remedies. Other remedies, supposed to act in the way of antidotes to uræmic poisoning, have been advised, such as acetic or benzoic acid, but they are far too uncertain to have any reliance placed on them, and they distract attention from more useful measures.

Precautions during the paroxysm. Precautions are necessary during the fits to prevent the patient injuring herself, especially to obviate laceration of the tongue; the latter can be best done by placing something between the teeth as the paroxysm comes on, such as the handle of a teaspoon enveloped in several folds of flannel.

Obstetric management. The obstetric management of eclampsia will naturally give rise to much anxiety, and on this point there has been considerable difference of opinion. On the one hand, we have practitioners who advise the immediate emptying of the uterus, even when labour has commenced; on the other,

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[1] *The Puerperal Diseases*, p. 120.

[2] *Berlin Klin. Woch.* June 16, 1879.

[3] *New York Med. Rec.* March 1, 1879.

those who would leave the labour entirely alone. Thus Gooch said, 'Attend to the convulsions, and leave the labour to take care of itself;' and Schroeder says, 'Especially no kind of obstetric manipulation is required for the safety of the mother,' but he admits, however, that it is sometimes advisable to hasten the labour to insure the safety of the child.

In cases in which the convulsions come on during labour, the pains are often strong and regular, the labour progresses satisfactorily, and no interference is needful. In others we cannot but feel that emptying the uterus would be decidedly beneficial. We have to reflect, however, that any active interference might, of itself, prove very irritating, and excite fresh attacks. The influence of uterine irritation is apparent by the frequency with which the paroxysms recur with the pains. If, therefore, the os be undilated, and labour have not begun, no active means to induce it should be adopted, although the membranes may be ruptured with advantage, since that procedure produces no irritation. Forcible dilatation of the os, and especially turning, are strongly contra-indicated.

The rule laid down by Tyler Smith seems that which is most advisable to follow—that we should adopt the course which seems least likely to prove a source of irritation to the mother. Thus if the fits seem evidently induced and kept up by the pressure of the fœtus, and the head be within reach, the forceps or even craniotomy may be resorted to. But if, on the other hand, there be reason to think that the operation necessary to complete delivery is likely *per se* to prove a greater source of irritation than leaving the case to nature, then we should not interfere.

CHAPTER IV.

PUERPERAL INSANITY.

Classifi-
cation.

UNDER the head of ' *Puerperal Mania* ' writers on ob-
stetrics have indiscriminately classed all cases of mental
disease connected with pregnancy and parturition. The re-
sult has been unfortunate, for the distinction between the
various types of mental disorder has, in consequence, been
very generally lost sight of. But little study of the subject
suffices to show that the term Puerperal Mania is wrong in
more ways than one, for we find that a large number of cases
are not cases of ' mania ' at all, but of melancholia ; while a
considerable number are not, strictly speaking, ' puerperal,'
as they either come on during pregnancy, or long after the
immediate risks of the puerperal period are over, being in
the latter case associated with anæmia produced by over-
Puerperal
insanity
may be
divided
into three
classes of
cases.
lactation. For the sake of brevity, the generic term, ' *Puer-
peral Insanity* ' may be employed to cover all cases of mental
disorders connected with gestation, which may be further
conveniently subdivided into three classes, each having its
special characteristics, viz. :—

I. The *Insanity of Pregnancy.*

II. *Puerperal Insanity*, properly so called, that is, insanity
coming on within a limited period after delivery.

III. The *Insanity of Lactation.*

This division is a strictly natural one, and includes all
the cases likely to come under observation. The relative
proportion these classes bear to each other can only be deter-
mined by accurate statistical observations on a large scale,
but these materials we do not possess. The returns from
large asylums are obviously open to objection, for only the
worst and most confirmed cases find their way into these
institutions, while by far the greater proportion, both before
and after labour, are treated in their own homes.

Taking such returns as only approximate, we find from Dr. Batty Tuke [1] that in the Edinburgh Asylum, out of 155 cases of puerperal insanity, 28 occurred before delivery, 73 during the puerperal period, and 54 during lactation. The relative proportions of each per hundred are as follows :—

Insanity of pregnancy,   18·06 per cent.
Puerperal insanity,   47·09   ,,
Insanity of lactation,   34·83   ,,

Marcé [2] collects together several series of cases from various authorities, amounting to 310 in all, and the results are not very different from those of the Edinburgh Asylum, except in the relatively smaller number of cases occurring before delivery. The percentage is calculated from his figures :—

Insanity of pregnancy,   8·06 per cent.
Puerperal insanity,   58·06   ,,
Insanity of lactation,   30·30   ,,

As each of these classes differs in various important respects from the others, it will be better to consider each separately.

The Insanity of Pregnancy is, without doubt, the least common of the three forms. The intense mental depression which in many women accompanies pregnancy, and causes the patient to take a despondent view of her condition, and to look forward to the result of her labour with the most gloomy apprehension, seems to be often only a lesser degree of the actual mental derangement which is occasionally met with. The relation between the two states is further borne out by the fact that a large majority of cases of insanity during pregnancy are well-marked types of melancholia ; out of 28 cases, reported by Tuke, 15 were examples of pure melancholia, 5 of dementia with melancholia. In many of these the attack could be traced as developing itself out of the ordinary hypochondriasis of pregnancy. In others the symptoms come on at a later period of pregnancy, the earlier months of which had not been marked by any unusual lowness of spirits. The age of the patient seems to have some influence, the proportion of cases between 30 and 40 years of age being much larger than in younger women. A larger proportion of cases occur in primiparæ than in multiparæ, a fact that, no doubt, depends on the greater dread and appre-

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[1] Edin. Med. Journ. vol. x.
[2] Traité de la Folie des Femmes enceintes.

hension experienced by women who are pregnant for the first time, especially if not very young. Hereditary disposition plays an important part, as in all forms of puerperal insanity. It is not always easy to ascertain the fact of an hereditary taint, since it is often studiously concealed by the friends. Tuke, however, found distinct evidence of it in no less than 12 out of 28 cases. Fürstner[1] believes that other neuroses have an important influence in the causation of the disease. Out of 32 cases he found direct hereditary taint in 9, but in 11 more there was a family history of epilepsy, drunkenness, or hysteria.

Period of pregnancy at which it occurs. — The period of pregnancy at which mental derangement most commonly shows itself varies. Most generally, perhaps, it is at the end of the third, or the beginning of the fourth month. It may, however, begin with conception, and even return with every impregnation. Montgomery relates an instance in which it recurred in three successive pregnancies. Marcé distinguishes between true insanity coming on during pregnancy and aggravated hypochondriasis, by the fact that the latter usually lessens after the third month, while the former most commonly only begins after that date. It is unquestionable that in many cases no such distinction can be made, and that the two are often very intimately associated.

Form of insanity. — The form of insanity does not differ from ordinary melancholia. The suicidal tendency is generally very strongly developed. Should the mental disorder continue after delivery, the patient may very probably experience a strong impulse to kill her child. Moral perversions have not been uncommonly observed. Tuke especially mentions a tendency to dipsomania in the early months, even in women who have not shown any disposition to excess at other times. He suggests that this may be an exaggeration of the depraved appetite, or morbid craving, so commonly observed in pregnant women, just as melancholia may be a further development of lowness of spirits. Laycock mentions a disposition to ' kleptomania ' as very characteristic of the disease. Casper[2] relates a curious case where this occurred in a pregnant lady of rank, and the influence of pregnancy, in

[1] *Archiv für Psychiatrie*, Band v. Heft 2.
[2] Casper's *Forensic Medicine*, New Syd. Soc. vol. iv. p. 308.

developing an irresistible tendency, was pleaded in a criminal trial in which one of her petty thefts had involved her.

The prognosis may be said to be, on the whole, favour- Prognosis. able. Out of Dr. Tuke's 28 cases, 19 recovered within six months. There is little hope of a cure until after the termination of the pregnancy, as out of 19 cases recorded by Marcé only in 2 did the insanity disappear before delivery.

There is a peculiar form of mental derangement some- Transient
mania
during
delivery. times observed during labour, which is by some talked of as a temporary insanity. It may, perhaps, be more accurately described as a kind of acute delirium, produced, in the latter stage of labour, by the intensity of the suffering caused by the pains. According to Montgomery, it is most apt to occur as the head is passing through the os uteri, or, at a later period, during the expulsion of the child. It may consist of merely a loss of control over the mind, during which the patient, unless carefully watched, might, in her agony, seriously injure herself or her child. Sometimes it produces actual hallucination, as in the case described by Tarnier, in which the patient fancied she saw a spectre standing at the foot of her bed, which she made violent efforts to drive away. This kind of mania, if it may be so called, is merely transitory in its character, and disappears as soon as the labour is over. From a medico-legal point of view it may be of importance, as it has been held by some that in certain cases of infanticide the mother has destroyed the child when in this state of transient frenzy, and when she was irresponsible for her acts. In the treatment of this variety of delirium we must, of course, try to lessen the intensity of the suffering, and it is in such cases that chloroform will find one of its most valuable applications.

True puerperal insanity has always attracted much atten- Puerperal
insanity
(proper). tion from obstetricians, often to the exclusion of other forms of mental disturbance connected with the puerperal state. We may define it to be, that form of insanity which comes on within a limited period after delivery, and which is probably intimately connected with that process. Out of 73 examples of the disease tabulated by Dr. Tuke, only 2 came on later than a month after delivery, and in these there were other causes present, which might possibly remove them from this class.

Form of
insanity.

Although a large number of these cases assume the character of acute mania, that is by no means the only kind of insanity which is observed, a not inconsiderable number being well-marked examples of melancholia. The distinction between them was long ago pointed out by Gooch, whose admirable monograph on the disease contains one of the most graphic and accurate accounts of puerperal insanity that has yet been written.

Acute
mania
generally
occurs
shortly
after
delivery;
melan-
cholia at
a later
period.

There are also some peculiarities as to the period at which these varieties of insanity show themselves, which, taken in connection with certain facts in their etiology, may eventually justify us in drawing a stronger line of demarcation between them than has been usual. It appears that cases of acute mania are apt to come on at a period much nearer delivery than melancholia. Thus Tuke found that all the cases of mania came on within sixteen days after delivery, and that all cases of melancholia developed themselves after that period. We shall presently see that one of the most recent theories as to the causation of the disease attributes it to some morbid condition of the blood. Should further investigation confirm this supposition, inasmuch as septic conditions of the blood are most likely to occur a short time after labour, it would not be an improbable hypothesis that cases of acute mania, occurring within a short time after labour, may depend on such septic causes, while melancholia is more likely to arise from general conditions favouring the development of mental disease. This must, however, be regarded as a mere speculation requiring further investigation.

Causes.

Hereditary predisposition is very frequently met with, and a careful inquiry into the patient's history will generally show that other members of the family have suffered from mental derangement. Reid found that out of 111 cases in Bethlehem Hospital, there was clear evidence of hereditary taint in 45. Tuke made the same observation in 22 out of his 73 cases ; and, indeed, it is pretty generally admitted by all alienist physicians that hereditary tendencies form one of the strongest predisposing causes of mental disturbance in the puerperal state. In a large proportion of cases circumstances producing debility and exhaustion, or mental depression, have preceded the attack. Thus it is often found that patients attacked with it have had post-partum hæmorrhage,

or have suffered from some other conditions producing exhaustion, such as severe and complicated labour; or they may have been weakened by over-frequent pregnancies; or by lactation during the early months of pregnancy. Indeed, anæmia is always well marked in this disease. Mental conditions also are frequently traceable in connection with its production. Morbid dread during pregnancy, insufficient to produce insanity before delivery, may develop into mental derangement after it. Shame and fear of exposure in unmarried women not unfrequently lead to it, as is evidenced by the fact that out of 2,281 cases, gathered from the reports of various asylums, above 64 per cent. were unmarried.[1] Sudden moral shocks, or vivid mental impressions, may be the determining cause in predisposed persons. Gooch narrates an example of this in a lady who was attacked immediately after a fright produced by a fire close to her house, the hallucinations in this case being all connected with light; and Tyler Smith that of another whose illness dated from the sudden death of a relative. The age of the patient has some influence, and there seems to be a decidedly greater liability at advanced ages, especially when such women are pregnant for the first time.

The possibility of the acute form of puerperal insanity, coming on shortly after delivery, being dependent on some form of septicæmia is one which deserves careful consideration. The idea originated with Sir James Simpson, who found albumen in the urine of 4 patients. He suggested that this might properly indicate the presence in the blood of certain urinary constituents, which might have determined the attack much in the same way as in eclampsia. Dr. Donkin subsequently wrote an important paper,[2] in which he warmly supported this theory, and arrived at the conclusion 'that the acute dangerous class of cases are examples of uræmic blood-poisoning, of which the mania, rapid pulse, and other constitutional symptoms are merely the phenomena; and that the affection, therefore, ought to be termed uræmic or renal puerperal mania, in contradistinction to the other form of the disease.' He also suggests that the immediate poison may be carbonate of ammonia, resulting

Theory of its dependence on morbid state of the blood.

[1] *Journ. of Mental Science*, 1870–71, p. 159.
[2] *Edin. Med. Journ.* vol. vii.

from the decomposition of urea retained in the blood. It will be observed, therefore, that the pathological condition producing puerperal mania would, supposing this theory to be correct, be precisely the same as that which, at other times, is supposed to give rise to puerperal eclampsia. There can be no doubt that the patient, immediately after delivery, is in a condition rendering her peculiarly liable to various forms of septic disease; and it must be admitted that there is no inherent improbability in the supposition that some morbid material circulating in the blood may be the effective cause of the attack, in a person otherwise predisposed to it. It is also certain, as I have already pointed out, that there are two distinct classes of cases, differing according to the period after delivery at which the attack comes on. Whether this difference depends on the presence in the blood of some septic matter—especially urinary excreta—is a question which our knowledge by no means justifies us in answering; it is, however, one which well merits further careful study.

Objections to this theory.

It is only fair to point out some difficulties which appear to militate against the view which Dr. Donkin maintains. In the first place, the albuminuria is merely transient, while its supposed effects last for weeks or months. Sir James Simpson says, with regard to his cases: 'I have seen all traces of albuminuria in puerperal insanity disappear from the urine within fifty hours of the access of the malady. The general rapidity of its disappearance is, perhaps, the principal, or, indeed, the only reason why this complication has escaped the notice of those physicians among us who devote themselves with such ardour and zeal to the treatment of insanity in our public asylums.' This apparent anomaly Simpson attempts to explain by the hypothesis that, when once the uræmic poisoning has done its work, and set the disease in progress, the mania progresses of itself. This, however, is pure speculation; and, in the supposed analogous case of eclampsia, the albuminuria certainly lasts as long as its effects. It is not easy to understand, also, why uræmic poisoning should in one case give rise to insanity, and in another to convulsions. For all we know to the contrary, transient albuminuria may be much more common after delivery than has been generally supposed, and further investigation on this point is required. Albumen is by no

means unfrequently observed in the urine, for a short time, in various conditions of the body, without any serious consequences, as, for example, after bathing ; and we may too readily draw an unjustifiable conclusion from its detection in a few cases of mania. There are, however, many other kinds of blood-poisoning, besides uræmia, which may have an influence in the production of the disease, and it is to be hoped that future observations may enable us to speak with more certainty on this point.

The prognosis of puerperal insanity is a point which will always deeply interest those who have to deal with so distressing a malady. It may resolve itself into a consideration of the immediate risk to life, and of the chances of ultimate restoration of the mental faculties. It is an old aphorism of Gooch's, and one the correctness of which is justified by modern experience, that ' mania is more dangerous to life, melancholia to reason.' It has very generally been supposed that the immediate risk to life in puerperal mania is not great, and on the whole this may be taken as correct. Tuke found that death took place, from all causes, in 10·9 per cent. of the cases under observation ; these, however, were all women who had been admitted into asylums, and in whom the attack may be assumed to have been exceptionally severe. Great stress was laid by Hunter and Gooch on extreme rapidity of the pulse, as indicating a fatal tendency. There can be no doubt that it is a symptom of great gravity, but by no means one which need lead us to despair of our patient's recovery. The most dangerous class of cases are those attended with some inflammatory complication ; and if there be marked elevation of temperature, indicating the presence of some such concomitant state, our prognosis must be more grave that when there is mere excitement of the circulation. *Prognosis.*

There are no marked post-mortem signs found in fatal cases to guide us in forming an opinion as to the nature of the disease. ' No constant morbid changes,' says Tyler Smith, ' are found within the head, and most frequently the only condition found in the brain is that of unusual paleness and exsanguinity. Many pathologists have also remarked upon the extremely empty condition of the blood-vessels, particularly the veins.' *Post-mortem signs.*

The duration of the disease varies considerably. Gene-

rally speaking, cases of mania do not last so long as melancholia, and recovery takes place within a period of three months, often earlier. Very few of the cases admitted into the Edinburgh Asylum remained there more than six months, and after that time the chances of ultimate recovery greatly lessened. When the patient gets well, it often happens that her recollection of the events occurring during her illness is lost ; at other times, the delusions from which she suffered remain, as, for example, in a case which was under my care, in which the personal antipathies which the patient formed when insane became permanently established.

Fifty-four out of the 155 cases collected by Dr. Tuke were examples of the insanity of lactation, which would appear, therefore, to be nearly twice as common as that of pregnancy, but considerably less so than the true puerperal form. Its dependence on causes producing anæmia and exhaustion is obvious and well-marked. In the large majority of cases it occurs in multiparæ who have been debilitated by frequent pregnancies, and by length of nurs-

ing. When occurring in primiparæ, it is generally in women who have suffered from post-partum hæmorrhage or other causes of exhaustion, or whose constitution was such as should have contra-indicated any attempt at lactation. The bruit-de-diable is almost invariably present in the veins of the neck, indicating the impoverished condition of the blood.

The type is far more frequently melancholic than maniacal, and when the latter form occurs, the attack is much more transient than in true puerperal insanity. The danger to life is not great, especially if the cause producing debility be recognised and at once removed.

There seems, however, to be more risk of the insanity becoming permanent than in the other forms. In 12 out of Dr. Tuke's cases the melancholia degenerated into dementia, and the patients became hopelessly insane.

The symptoms of these various forms of insanity are practically the same as in the non-pregnant state.

Generally in cases of mania there is more or less premonitory indication of mental disturbance, which may pass unperceived. The attack is often preceded by restlessness and loss of sleep, the latter being a very common and well-

marked symptom : or, if the patient do sleep, her rest is
broken and disturbed by dreams.   Causeless dislikes to those
around her are often observed ; the nurse, the husband, the
doctor, or the child, becomes the object of suspicion, and,
unless proper care be taken, the child may be seriously
injured.   As the disease advances, the patient becomes in-
coherent and rambling in her talk, and, in a fully developed
case, she is incessantly pouring forth an unconnected jumble
of sentences, out of which no meaning can be made.   Often
some prevalent idea which is dwelling in the patient's
mind can be traced running through her ravings, and it has
been noticed that this is frequently of a sexual character,
causing women of unblemished reputation to use obscene
and disgusting language, which it is difficult to understand
their even having heard.   The tendency of such patients
to make accusations impugning their own chastity was spe-
cially insisted on by many eminent authorities in a recent
celebrated trial, when Sir James Simpson stated that in his
experience ' the organ diseased gave a type to the insanity,
so that with women suffering from affections of the genital
organs the delusions would be more likely to be connected
with sexual matters.'   Religious delusions—as a fear of
eternal damnation, or of having committed some unpardon-
able sin—are of frequent occurrence, but perhaps more often
in cases which are tending to the melancholic type.   There
is generally intolerable restlessness, and the patient's whole
manner and appearance are those of excessive excitement.
She may refuse to remain in bed, may tear off her clothes,
or attempt to injure herself.   The suicidal tendency is often
very marked.   In one case under my care, the patient made
incessant efforts to destroy herself, which were only frustrated
by the most careful watching ; she endeavoured to strangle
herself with the bedclothes, to swallow any article she could
lay hold of, and even to gouge out her own eyes.   Food
is generally persistently refused, and the utmost coaxing
may fail in inducing the patient to take nourishment.   The
pulse is rapid and small, and the more violent the excitement
and furious the delirium, the more excited is the circulation.
The tongue is coated and furred, the bowels constipated and
disordered, and the fæces, as well as the urine, are frequently
passed involuntarily.   The urine is scanty and high-coloured,
and, after the disease has lasted for some time, it becomes

loaded with phosphates. The lochia, and the secretion of milk, generally become arrested at the commencement of the disease. The waste of tissue, from the incessant restlessness and movement of the patient, is very great; and, if the disease continue for some time, she falls into a condition of marasmus, which may be so excessive that she becomes wasted to a shadow of her former size.

Symptoms of melancholia. When the insanity assumes the form of melancholia, its advent is more gradual. It may commence with depression of spirits, without any adequate cause, associated with insomnia, disturbed digestion, headache, and other indications of bodily derangement. Such symptoms showing themselves in women who have been nursing for a length of time, or in whom any other evident cause of exhaustion exists, should never pass unnoticed. Soon the signs of mental depression increase, and positive delusions show themselves. These may vary much in their amount, but they are all more or less of the same type, and very often of a religious character. The amount of constitutional disturbance varies much. In some cases which approach in character those of mania, there is considerable excitement, rapid pulse, furred tongue, and restlessness. Probably cases of acute melancholia, coming on during the puerperal state, most often assume this form. In others again there is less of these general symptoms, the patients are profoundly dejected, sit for hours without speaking or moving; but there is not much excitement, and this is the form most generally characterising the insanity of lactation. In all cases there is a marked disinclination to food. There is also, almost invariably, a disposition to suicide; and it should never be forgotten in melancholic cases that this may develop itself in an instant, and that a moment's carelessness on the part of the attendants may lead to disastrous results.

Treatment. Bearing in mind what has been said of the essential character of puerperal insanity, it is obvious that the course of treatment must be mainly directed to maintain the strength of the patient, so as to enable her to pass through the disease without fatal exhaustion of the vital powers, while we endeavour at the same time to calm the excitement, and give rest to the disturbed brain. Any over-active measures—for example, bleeding, blistering the shaven scalp, and the like—are distinctly contra-indicated.

There is a general agreement on the part of alienist physicians that in cases of acute mania the two things most needed are a sufficient quantity of suitable food and sleep.

Every endeavour should be made to induce the patient to take plenty of nourishment, to remedy the defects of the excessive waste of tissue, and support her strength until the disease abates. Dr. Blandford, who has especially insisted on the importance of this, says : [1] 'Now, with regard to the food, skilful attendants will coax a patient into taking a large quantity, and we can hardly give too much. Messes of minced meat with potato and greens, diluted with beef-tea, bread and milk, rum and milk, arrowroot, and so on, may be got down. Never give mere liquids as long as you can get down solids. As the malady progresses, the tongue and mouth may become so dry and foul that nothing but liquids can be swallowed ; but, reserving our beef-tea and brandy, let us give plenty of solid food while we can.'

Importance of administering nourishment.

The patient may in mania, as well as in melancholia, perhaps even more in the latter, obstinately refuse to take nourishment at all, and we may be compelled to use force. Various contrivances have been employed for this purpose. One of the simplest is introducing a dessert-spoon forcibly between the teeth, the patient being controlled by an adequate number of attendants, and slowly injecting into the mouth suitable nourishment, by an india-rubber bottle with an ivory nozzle, such as is sold by all chemists. Care must be taken not to inject more than an ounce at a time, and to allow the patient to breathe between each deglutition. So extreme a measure will seldom be required, if the patient have experienced attendants, who can overcome her resistance to food by gentler means; but it may be essential, and it is far better to employ it than to allow the patient to become exhausted from want of nourishment. In one case I had to feed a patient in this way three times a day for several weeks, and used for the purpose a contrivance known in asylums as Paley's feeding-bottle, which reduced the difficulty of the process to a minimum. Beef-tea, or strong soup, mixed with some farinaceous material, such as Revalenta Arabica, or wheaten flour, or milk, forms the best mess for this purpose.

Forcible administration of food.

[1] Blandford, *Insanity and its Treatment.*

In the early stages the patient is probably better without stimulants, which seem only to increase the excitement. As the disease progresses, and exhaustion becomes marked, it may be necessary to have recourse to them. In melancholia they seem to be more useful, and may be administered with greater freedom.

The state of the bowels requires especial attention. They are almost always disordered, the evacuations being dark and offensive in odour. In the early stages of the disease the prompt clearing of the bowels, by a suitable purgative, sometimes has the effect of cutting short an impending attack. A curious example of this is recorded by Gooch, in which the patient's recovery seemed to date from the free evacuation of the bowels. A few grains of calomel, or a dose of compound jalap powder, or of castor oil, may generally be readily given. During the continuance of the illness the state of the primæ viæ should be attended to, and occasional aperients will be useful, but strong and repeated purgation is hurtful, from the debility it produces.

The procuring sleep will necessarily form one of the most important points of treatment. For this purpose there is no drug so valuable as the hydrate of chloral, either alone or in combination with bromide of potassium, which has a distinct effect in increasing its hypnotic action. Given in a full dose at bedtime, say 15 grs. to ʒss., it rarely fails in procuring at least some sleep, and, in an early stage of acute mania, this may be followed by the best effects. It may be necessary to repeat this draught night after night, during the acute stage of the malady. If we cannot induce the patient to swallow the medicine, it may be given in the form of enema.

It is generally admitted that in mania preparations of opium, formerly much relied on in the treatment of the disease, are apt to do more harm than good. Dr. Blandford gives a strong opinion on this point. He says: 'In prolonged delirious mania I believe opium never does good, and may do great harm. We shall see the effects of narcotic poisoning if it be pushed, but none that are beneficial. This applies equally to opium given by the mouth and by subcutaneous injection. The latter, as it is more certain and effectual in producing good results, is also more deadly when

it acts as a narcotic poison. After the administration of a dose of morphia by the subcutaneous method, the patient will probably at once fall asleep, and we congratulate ourselves that our long-wished-for object is attained. But after half an hour or so the sleep suddenly terminates, and the mania and excitement are worse than before. Here you may possibly think that, had the dose been larger, instead of half an hour's sleep you would have obtained one of longer duration, and you may administer more, but with a like result. Large doses of morphia not merely fail to produce refreshing sleep ; they poison the patient, and produce, if not the symptoms of actual narcotic poisoning, at any rate that typhoid condition which indicates prostration and approaching collapse. I believe there is no drug, the use of which more often becomes abused, than that of opium.' It is otherwise in cases of melancholia, especially in the more chronic forms. In these, opiates in moderate doses, not pushed to excess, may be given with great advantage. The subcutaneous injection of morphia is by far the best means of exhibiting the drug, from its rapidity of action, and facility of administration.

There are other methods of calming the excitement of the patient besides the use of medicines. The prolonged use of the warm bath, the ‛patient being immersed in water at a temperature of 90° or 92° for at least half an hour, is highly recommended by some as a sedative. The wet pack serves the same purpose, and is more readily applied in refractory subjects. Other calmatives.

Judicious nursing is of primary importance. The patient should be kept in a cool, well-ventilated, and somewhat darkened room. If possible she should remain in bed, or, at least, endeavours should be made to restrain the excessive restless motion, which has so much effect in promoting exhaustion. The presence of relatives and friends, especially the husband, has generally a prejudicial and exciting effect ; and it is advisable to place the patient under the care of nurses experienced in the management of the insane, who, as strangers, are likely to have more control over her. It is not too much to say that much of the success in treatment must depend on the manner in which this indication is met. Rough, unskilled nurses, who do not know how to use gentle- Importance of judicious nursing.

ness combined with firmness, will certainly aggravate and prolong the disorder. Inasmuch as no patient should be left unwatched by day or night, more than one nurse is essential.

Question of removal to an asylum. The question of the removal of the patient to an asylum is one which will give rise to anxious consideration. As the fact of having been under such restraint of necessity fixes a certain lasting stigma upon a patient, this is a step which everyone would wish to avoid if possible. In cases of acute mania, which will probably last a comparatively short time, home treatment can generally be efficiently carried out. Much must depend on the circumstances of the patient. If these be of a nature which preclude the possibility of her obtaining thoroughly efficient nursing and treatment in her own home, it is advisable to remove her to a place where these essentials can be obtained, even at the cost of some subsequent annoyance. In cases of chronic melancholia, the management of which is on the whole more difficult, the necessity for such a measure is more likely to arise, and should not be postponed too late. Many examples of incurable dementia, arising out of puerperal melancholia, can be traced to unnecessary delay in placing the patients under the most favourable conditions for recovery.

Treatment during convalescence. When convalescence is commencing, change of air and scene will often be found of great value. Removal to some quiet country place, where the patient can enjoy abundance of air and exercise, in the company of her nurses, without the excitement of seeing many people, is especially to be recommended. Great caution must be used in admitting the visits of relatives and friends. In two cases under my own care the patients relapsed, when apparently progressing favourably, because the husbands insisted, contrary to advice, on seeing them. On the other hand, Gooch has pointed out that, when the patient is not recovering, when month after month has been passed in seclusion without any improvement, the visit of a friend or relative may produce a favourable moral impression, and inaugurate a change for the better. It is probably in cases of melancholia, rather than in mania, that this is likely to happen. The experiment may, under such circumstances, be worth trying; but it is one the result of which we must contemplate with some anxiety.

CHAPTER V.

PUERPERAL SEPTICÆMIA.

THERE is no subject in the whole range of obstetrics which has caused so much discussion and difference of opinion as that to which this chapter is devoted. Under the name of 'Puerperal Fever,' the disease we have to consider has given rise to endless controversy. One writer after another has stated his view of the nature of the affection with dogmatic precision, often on no other grounds than his own preconceived notions, and an erroneous interpretation of some of the post-mortem appearances. Thus, one states that puerperal fever is only a local inflammation, such as peritonitis; others declare it to be phlebitis, metritis, metro-peritonitis, or an essential zymotic disease *sui generis*, which affects lying-in women only. The result has been a hopeless confusion; and the student rises from the study of the subject with little more useful knowledge that when he began. Fortunately, modern research is beginning to throw a little light upon this chaos.

Difference of opinion as to puerperal fever.

Confusion resulting from this cause.

The whole tendency of recent investigation is daily rendering it more and more certain that obstetricians have been led into error by the special virulence and intensity of the disease, and that they have erroneously considered it to be something special to the puerperal state, instead of recognising in it a form of septic disease practically identical with that which is familiar to surgeons under the name of pyæmia or septicæmia.

Modern view of the disease.

If this view be correct, the term 'puerperal fever,' conveying the idea of a fever such as typhus or typhoid, must be acknowledged to be misleading, and one that should be discarded, as only tending to confusion. Before discussing at length the reasons which render it probable that the

Objection to the name 'puerperal fever.'

disease is in no way specific, or peculiar to the puerperal state, it will be well to relate briefly some of the leading facts connected with it.

History of the disease.

More or less distinct references to the existence of the so-called puerperal fever are met with in the classical authors, proving, beyond doubt, that the disease was well known to them ; and Hippocrates, besides relating several cases, the nature of which is unquestionable, clearly recognises the possibility of its originating in the retention and decomposition of portions of the placenta. Although Harvey and other writers showed that they were more or less familiar with it, and even made most creditable observations on its etiology, it was not until the latter half of the last century that it came prominently into notice. At that time the frightful mortality occurring in some of the principal lying-in hospitals, especially in the Hôtel Dieu at Paris, attracted attention ; and ever since the disease has been familiar to obstetricians.

Mortality resulting from it in lying-in hospitals.

Its prevalence in hospitals in which lying-in women are congregated has been constantly observed both in this country and abroad, occasionally producing an appalling death-rate ; the disease, when once it has appeared, frequently spreading from one patient to another, in spite of all that could be done to arrest it. It would be easy to give many startling instances of this. Thus, it prevailed in London in the years 1760, 1768, and 1770, to such an extent that in some lying-in institutions nearly all the patients died. Of the Edinburgh Infirmary, in 1773, it is stated that ' almost every woman, as soon as she was delivered, or perhaps about twenty-four hours after, was seized with it, *and all of them died*, though every method was used to cure the disorder.' On the Continent, where the lying-in institutions are on a much larger scale, the mortality was equally great. Thus in the Maison d'Accouchements of Paris, in a number of different years, sometimes as many as 1 in 3 of the women delivered died ; on one occasion 10 women dying out of 15 delivered. Similar results were observed in other great Continental hospitals, as in Vienna, where, in 1823, 19 per cent. of the cases died, and, in 1842, 16 per cent. ; and in Berlin, in 1862, hardly a single patient escaped, the hospital being eventually closed.

Such facts, the correctness of which is beyond any question, prove to demonstration the great risk which may accompany the aggregation of lying-in women. Whether they justify the conclusion that all lying-in hospitals should be abolished, is another and a very wide question, which can scarcely be satisfactorily discussed in a practical work. It is to be observed, however, that most of the cases in which the disease produced such disastrous results occurred before our more recent knowledge of its mode of propagation was acquired, when no sufficient hygienic precautions were adopted, when ventilation was little thought of, and when, in a word, every condition prevailed that would tend to favour the spread of a contagious disease from one patient to another. More recent experience proves that, when the contrary is the case, the occurrence of epidemics of this kind may be entirely prevented, and the mortality approximated to that of home practice. The results obtained almost universally of late years by the introduction of strict anti-sepsis in lying-in institutions afford a most instructive commentary on the causes of puerperal fever. Thus, in the Maternité, in Paris, the mortality from 1858 to 1870 was 1 in 11; at the present time it is only 1 in 100. At the Foundling Hospital in St. Petersburg the mortality before the introduction of antiseptics was 1 in 27; since their use 1 in 147. Similar satisfactory results have been reported in lying-in institutions in London, America, and indeed universally wherever anti-septic precautions have been adopted.[1]

Do these facts justify the inference that lying-in hospitals should be abolished

The more closely the history of these outbreaks in hospitals is studied, the more apparent does it become that they are not dependent on any miasm necessarily produced by the aggregation of puerperal patients, but on the direct conveyance of septic matter from one patient to another.

The assumption of a puerperal miasm is unnecessary.

In numerous instances the disease has been said to be generally epidemic in domiciliary practice, much in the same way as scarlet fever, or any zymotic complaint, might be. Such epidemics are described as having occurred in London in 1827–28, in Leeds in 1809–12, in Edinburgh in 1825, and many others might be cited. There is, however, no sufficient ground for believing that the disease has ever

There is no sufficient ground for believing in general epidemics of the disease.

[1] See 'The Prevention of Lying-in Fever,' by Vassili Sutigin, *Edin. Med. Journ.* March 1885.

been epidemic in the strict sense of the word. That numerous cases have often occurred in the same place, and at the same time, is beyond question; but this can easily be explained without admitting an epidemic influence, knowing, as we do, how readily septic matter may be conveyed from one patient to another. In many of the so-called epidemics the disease has been limited to the patients of certain midwives or practitioners, while those of others have entirely escaped; a fact easily understood on the assumption of the disease being produced by septic matter conveyed to the patient, but irreconcilable with the view of general epidemic influence. We are not in possession of any reliable statistics of the mortality arising from puerperal septicæmia in ordinary general practice. It has, however, been well pointed out in the Report on Puerperal Fever, presented by the Obstetrical Society of Berlin to the Prussian Minister of Health,[1] that not only do the published returns of death from metria afford no reliable estimate of the actual mortality from this source, but that they are very far more numerous than deaths from any other cause in connection with pregnancy and childbirth.

Numerous theories advanced regarding its nature.   It would be a useless task to detail at length the theories that have been advanced to explain the disease. Indeed, it may safely be held that the supposed necessity of providing a theory which would explain all the facts of the disease has done more to surround it with obscurity than even the difficulties of the subject itself. If any real advance is to be made, it can only be by adopting a humble attitude, by admitting that we are only on the threshold of the inquiry, and by a careful observation of clinical facts, without drawing from them too positive deductions.

Theory of its local origin.   Many have taught that the disease is essentially a local inflammation, producing secondary constitutional effects. This view doubtless originated from too exclusive attention to the morbid changes found on post-mortem examination. Extensive peritonitis, phlebitis, inflammation of the lymphatics, or of the tissues of the uterus, are very commonly found after death; and each of these has, in its turn, been believed to be the real source of the disease. This view finds but little favour with modern pathologists, and is in so many

[1] See *Edin. Med. Journ.* Nov. 1878.

ways inconsistent with clinical facts that it may be considered to be obsolete. No one of the conditions above mentioned is universally found, and in the worst cases definite signs of local inflammation may be entirely absent. Nor will this theory explain the conveyance of the disease from one patient to another, or the peculiar severity of the constitutional symptoms. Objections to this theory.

A more admissible theory, and one which has been extensively entertained, is, that there is an essential zymotic fever peculiar to, and only attacking, puerperal women, which is as specific in its nature as typhus or typhoid, and to which the local phenomena observed after death bear the same relation that the pustules on the skin do to small-pox, or the ulcers in the intestinal glands to typhoid. This fever is supposed to spread by contagion and infection, and to prevail epidemically, both in private and in hospital practice. The most recent exponent of this view is Fordyce Barker, who, in his excellent work on the 'Puerperal Diseases,' has entered at length into all the theories of the disease. He, like others who hold his opinions, has, I cannot but think, entirely failed to bring forward any conclusive evidence of the existence of such a specific fever. It is, no doubt, true that in typhus and typhoid, and other undoubted examples of this class of disease, there are well-marked local secondary phenomena; but then they are distinct and constant. He makes no attempt to prove that anything of the kind occurs in puerperal fever. On the contrary, probably there are no two cases in which similar local phenomena occur; nor is there any case in which the most practised obstetrician could foretell, either the course and duration of the illness, or the local phenomena. Again, this theory altogether fails to explain the very important class of cases which can be distinctly traced to sources originating in the patient herself, viz., the absorption of septic matter from decomposing coagula, and the like. Barker meets this difficulty by placing such cases of auto-infection under a separate category, admitting that they are examples of septicæmia. But he fails to show that there is any difference in symptomatology or post-mortem signs between them and the cases he believes to depend on an essential fever; nor would it be possible to Theory of an essential zymotic fever. Arguments against it.

distinguish the one from the other by either their clinical or pathological history.

The modern view, which holds that the disease is, in fact, identical with the condition known as pyæmia or septicæmia, is by no means free from objections, and much patient clinical investigation is required to give a satisfactory explanation of certain peculiarities which the disease presents; but, in spite of these difficulties, which time may serve to remove, it offers a far better explanation of the phenomena observed than any other that has yet been advanced.

According to this theory, the so-called puerperal fever is produced by the absorption of septic matter into the system, through solutions of continuity in the generative tract, such as always exist after labour. It is not essential that the poison should be peculiar or specific; for, just as in surgical pyæmia, any decomposing organic matter, either originating within the generative organs of the patient herself, or coming from without, may set up the morbid action.

In describing the disease under discussion, I shall assume that, so far as our present knowledge goes, this view is the one most consonant with facts; but, bearing in mind that very little is yet known of surgical septicæmia, it must not be expected that obstetricians can satisfactorily explain all the phenomena they observe.

The best basis of description I know of is that given by Burdon Sanderson, when he says, ' In every pyæmic process you may trace a focus, a centre of origin, lines of diffusion or distribution, and secondary results from the distribution. In every case an initial process from which infection commences, from which the infection spreads, and secondary processes which come out of this primary one.' [1] Adopting this division, I shall first treat of the mode in which the infection may commence in obstetric cases and point out the special difficulties which this part of the subject presents.

The fact that all recently delivered women present lesions of continuity in the generative tract, through which septic matter, brought into contact with them, may be readily absorbed, has long been recognised. The analogy between the interior of the uterus after delivery and the surface of a stump after amputation, was particularly insisted on by

[1] *Clinical Transactions*, vol. viii. p. cviii.

Cruveilhier, Simpson, and others—an analogy which was, to a great extent, based on erroneous conceptions of what took place—since they conceived that the whole interior of the uterus was bared. It is now well known that that is not the case ; but the fact remains that at the placental site, at any rate, there are open vessels through which absorption may readily take place. That absorption of septic material occurs through this channel is probable in certain cases in which decomposing materials exist in the interior of the uterus, especially when, from defective uterine contraction, the venous sinuses are abnormally patulous, and are not occluded by thrombi. It is difficult to understand how septic matter, introduced from without, can reach the placental site. Other sites of absorption are, however, always available. These exist in every case in the form of slight abrasions or lacerations about the cervix, or in the vagina, or, especially in primiparæ, about the fourchette and perinæum. There is even some reason to think that absorption of septic matter may take place through the mucous membrane of the vagina or cervix without any breach of surface. This might serve to account for the occasional, although rare cases, in which symptoms of the disease develop themselves before delivery or so soon after it as to show that the infection must have preceded labour ; nor is there any inherent improbability in the supposition that septic material may be occasionally absorbed through the unbroken mucous membrane, as is certainly the case with some poisons, for example that of syphilis. Hence there is no difficulty in recognising the similarity of a lying-in woman to a patient suffering from a recent surgical lesion, or in understanding how septic matter conveyed to her, during or shortly after labour, may be absorbed. It is necessary, however, to suppose that absorption takes place immediately or very shortly after these lesions of continuity are formed, for it is well known that the power of absorption is arrested after they have commenced to heal. This fact may explain the cases in which sloughing about the perinæum or vagina exists without any septicæmia resulting, or the far from uncommon cases in which an intensely fœtid lochial discharge may be present a few days after delivery, without any infection taking place.

The character and sources of the septic matter constitute

one of the most obscure questions in connection with septi-
cæmia, and that which is most open to discussion.

The most practical division of the subject is into cases
in which the septic matter originates within the patient, so
that she infects herself, the disease then being properly
autogenetic ; and into those in which the septic matter is
conveyed from without, and brought into contact with ab-
sorptive surfaces in the generative tract, the disease then
being *heterogenetic*.

The sources of auto-infection may be various, but they
are not difficult to understand. Any condition giving rise to
decomposition, either of the tissues of the mother herself,
of matters retained in the uterus or vagina that ought to
have been expelled, or decomposing matter derived from a
putrid fœtus, may start the septicæmic process. Thus it
may happen that from continuous pressure on the maternal
soft parts during labour, sloughing has set in ; or there may
be already decomposing material present from some previous
morbid state of the genital tracts, as in carcinoma. A more
common origin is the retention of coagula, or of small portions
of membrane, or of placenta, in the interior of the uterus,
which have putrefied from access of air ; or in the decompo-
sition of the lochia. That the retention of portions of the
placental tissue has at all times been the cause of septicæmia
may be illustrated by the case of the Duchesse d'Orléans (in
the time of Louis XIII.), who had an easy labour, but died
of child-bed fever. An examination was made by the leading
physicians of Paris, in their report of which it was stated :
' On the right side of the womb was found a small portion of
after-birth, so firmly adherent that it could hardly be torn
off by the finger-nails.' [1] The reason why self-infection does
not more often occur from such sources, since more or less
decomposition is of necessity so often present, has already
been referred to in the fact that absorption of such matters
is not apt to occur when the lesions of continuity, always
existing after parturition, have commenced to heal. This
observation may also serve to explain how previous bad states
of health, by interfering with the healthy reparative process
occurring after delivery, may predispose to self-infection. It

[1] *Louise Bourgeois*, by Goodell.

is interesting to note that puerperal septicæmia, arising from
such sources, is not limited to the human race. In the
debate on pyæmia at the Clinical Society, Mr. Hutchinson
recorded several well-marked examples occurring in ewes, in
whose uteri portions of retained placenta were found.

The sources of septic matter conveyed from without are
much more difficult to trace, and there are many facts con-
nected with heterogenetic infection which are very difficult
to reconcile with theory, and of which, it must be admitted,
we are not yet able to give a satisfactory explanation. Source of hetero-genetic infection.

It is probable that any decomposing organic matter may
infect, but that some forms operate with more certainty and
greater virulence than others. Any de-composing organic matter may in-fect.

One of these, which has attracted special attention, is
what may be termed cadaveric poison, derived from dissection
of the dead subject in the anatomical and post-mortem
theatres, and conveyed to the genital tract by the hands of
the accoucheur. Attention was particularly directed to this Influence of cada-veric poisoning.
source of infection by the observations of Semmelweiss, who
showed that in the division of the Vienna Lying-in Hospital
attended by medical men and students who frequented the
dissecting rooms the mortality was seldom less than 1 in 10,
while in the division solely attended by women the mortality
never exceeded 1 in 34; the number of deaths in the former
division at once falling to that of the latter, so soon as proper
precautions and means of disinfection were used. Many
other facts of a like nature have since been recorded, which
render this origin of puerperal septicæmia a matter of cer-
tainty. An interesting example is related by Simpson with
characteristic candour :—' In 1836 or 1837 Mr. Sidey, of this
city, had a rapid succession of five or six cases of puerperal
fever in his practice, at a time when the disease was not
known to exist in the practice of any other practitioners in
the locality. Dr. Simpson, who had then no firm or proper
belief in the contagious propagation of puerperal fever,
attended the dissection of Mr. Sidey's patients, and freely
handled the diseased parts. The next four cases of mid-
wifery which Dr. Simpson attended were all affected with
puerperal fever, and it was the first time he had seen it in
practice. Dr. Patterson, of Leith, examined the ovaries, &c.
The three next cases which Dr. Patterson attended in that

town were attacked with the disease.'[1] Negative examples
are of course brought forward of those who have attended
post-mortem examinations without injury to their obstetric
patients, which merely prove that the cadaveric poison does
not, of necessity, attach itself to the hands of the dissector ;
and no amount of such testimony can invalidate such positive
evidence as that just narrated. Barnes believes that there
is not so much danger attending the dissection of patients
who have died of any ordinary disease, but that the risk
attending the dissection of those who have died of infectious
or contagious complaints is very great indeed.[2] I presume
there is no doubt that the risk is greater when the subject
has died from zymotic disease ; but the distinction is too
delicate to rely on, and the attendant on midwifery will cer-
tainly err on the safe side by avoiding, as much as possible,
having anything to do with the conduct of dissections or
post-mortem examinations.

Infection from ery-sipelas.   Another possible source of infection is erysipelatous
disease in all its forms. The intimate connection between
erysipelas and surgical pyæmia has long been recognised by
surgeons, and the influence of erysipelas in producing puer-
peral septicæmia has been specially observed in surgical
hospitals into which lying-in patients were also admitted.
Trousseau relates instances of this kind occurring in Paris.
The only instance that I know of in London was in the
Expe-rience in the lying-in ward at King's College Hospital.   lying-in ward of King's College Hospital, where, in spite of
every hygienic precaution, the mortality was so great as to
necessitate the closure of the ward. Here the association
of erysipelas with puerperal septicæmia was again and again
observed ; the latter proving fatal in direct proportion to
the prevalence of the former in the surgical wards. The de-
pendence of the two on the same poison was in one instance
curiously shown by the fact of the child of a patient who
died of puerperal septicæmia dying from erysipelas which
started from a slight abrasion produced by the forceps. A
more recent and very remarkable example is related by Dr.
Lombe Atthill.[3] A patient suffering from erysipelas was
admitted into the Rotunda Hospital on February 15, 1877.

[1] *Selected Obstet. Works*, p. 508.
[2] ' Lectures on Puerperal Fever,' *Lancet*, vol. ii. 1865.
[3] *Medical Press and Circular*, April 1877.

The sanitary condition of the hospital was at the time excellent. The patient was removed next day, but of the next 10 patients confined in adjoining wards, 9 were attacked with puerperal peritonitis, the only one who escaped being a case of abortion. But the connection between erysipelas and puerperal septicæmia is not limited to hospitals, having been often observed in domiciliary practice. Some interesting facts have been collected by Dr. Minor,[1] who has shown that the two diseases have frequently prevailed together in various parts of the United States, and that during a recent outbreak of puerperal fever in Cincinnati it occurred chiefly in the practice of those physicians who attended cases of erysipelas. Many children also died from erysipelas whose mothers had died from puerperal fever.

Connection of the two diseases observed in America.

There is good reason to believe that the contagium of other zymotic diseases may produce a form of disease indistinguishable from ordinary puerperal septicæmia, and presenting none of the characteristic features of the specific complaint from which the contagium was derived. This is admitted to be a fact by the majority of our most eminent British obstetricians, although it does not seem to be allowed by Continental authorities, and it is strongly controverted by some writers in this country. It is certainly difficult to reconcile this with the theory of septicæmia, and we are not in a position to give a satisfactory explanation of it. I believe, however, that the evidence in favour of the possibility of puerperal septicæmia originating in this way is too strong to be assailable.

Infection from other zymotic diseases.

This origin of puerperal septicæmia is denied by many.

The scarlatinal poison is that regarding which the greatest number of observations have been made. Numerous cases of this kind are to be found scattered through our obstetric literature, but the largest number are to be met with in a paper by Dr. Braxton Hicks in the 12th volume of the 'Obstetrical Transactions,' and they are especially valuable from that gentleman's well-known accuracy as a clinical observer. Out of 68 cases of puerperal disease seen in consultation, no less than 37 were distinctly traced to the scarlatinal poison. Of these 20 had the characteristic rash of the disease ; but the remaining 17, although the history clearly proved exposure to the contagium of scarlet fever,

Evidence in its favour : cases produced by the contagion of scarlet fever.

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[1] *Erysipelas and Child-bed Fever.* Cincinnati, 1874.

showed none of its usual symptoms, and were not to be distinguished from ordinary typical cases of the so-called puerperal fever. On the theory that it is impossible for the specific contagious diseases to be modified by the puerperal state, we have to admit that one physician met with 17 cases of puerperal septicæmia in which, by a mere coincidence, the contagion of scarlet fever had been traced, and that the disease nevertheless originated from some other source ; an hypothesis so improbable that its mere mention carries its own refutation.

Cases produced by the contagion of other zymotic diseases.

With regard to the other zymotic diseases the evidence is not so strong ; probably from the comparative rarity of the diseases. Hicks mentions one case in which the diphtheritic poison was traced, although none of the usual phenomena of the disease were present. I lately saw a case in which a lady, a few days after delivery, had a very serious attack of septicæmia, without any diphtheritic symptoms, her husband being at the same time attacked with diphtheria of a most marked type. Here it would be difficult not to admit the dependence of the two diseases on the same poison.

The zymotic diseases are not always modified in the puerperal state. Probable explanation of this fact.

It is, however, certain that all the zymotic diseases may attack a newly delivered woman, and run their characteristic course without any peculiar intensity. Probably most practitioners have seen cases of this kind ; and this is precisely one of the points of difficulty which we cannot at present explain, but on which future research may be expected to throw some light. It seems to me not improbable that the explanation of the fact that zymotic poison may, in one puerperal patient, run its ordinary course, and in another produce symptoms of intense septicæmia, may be found in the channel of absorption. It is, at any rate, comprehensible that if the contagium be absorbed through the skin or the ordinary channel it may produce its characteristic symptoms and run its usual course ; while if brought into contact with lesions of continuity in the generative tract, it may act more in the way of septic poison, or with such intensity that its specific symptoms are not developed.

It may reasonably be objected that if puerperal and surgical septicæmia be identical, the zymotic poisons ought to be similarly modified when they infect patients after surgical operations. The subject of specific contagium as a

cause of surgical pyæmia has been so little studied, that I do not think any one would be justified in asserting that such an occurrence is not possible. Fritsch, of Halle, and other German physicians, have recently shown how elaborate antiseptic precautions in lying-in hospitals may prevent the origin of the disease from such sources. Sir James Paget, in his ‘Clinical Lectures,’ seems to believe in the possibility of such modification. He says : ‘ I think it not improbable that, in some cases, results occurring with obscure symptoms, within two or three days after operations, have been due to scarlet-fever poison, hindered in some way from its usual progress.’ Sir Spencer Wells informs me that he has seen cases of surgical pyæmia which he had reason to believe originated in the scarlatinal poison ; and his well-known success as an ovariotomist is, no doubt, in a great measure to be attributed to his extreme care in seeing that no one, likely to come in contact with his patients, has been exposed to any such source of infection.

Can surgical pyæmia be produced in this way ?

Exposure to sewer gas may, I feel sure, produce the disease. In two cases of the kind I had the opportunity of closely watching, an untrapped drain opened directly into the bedroom—in one instance into a bath, in the other into a water-closet. Both cases were indistinguishable from the ordinary form of the disease, and in both improvement commenced as soon as the patient was removed into another room.

Sewer gas and defective sanitary arrangements.

In a case I saw some years ago in Notting Hill, the patient, who had been confined within a week, had all the symptoms of a most intense attack of septicæmia, but none of a diphtheritic character, while her husband lay in an adjoining room suffering from a diphtheritic sore-throat. Here the waste-pipe of the bath was found to communicate directly with the sewer. In spite of her intense illness, I had the patient removed to another house, and from that moment she began to improve. In two other cases in which the same source of disease was detected, the removal of the patient from the infected atmosphere was immediately followed by a marked amelioration in the symptoms. I know of three similar cases which ended fatally, in which I have every reason to believe that the cause of the disease was poisoning by sewer gas. Frankenhauser has related a

curious case of the poisoning of four puerperal women by sewer gas. In fact, the whole question of defective sanitary conditions on the puerperal state deserves much more serious study than it has ever yet received, and I have long been satisfied that they have often much to do with certain grave forms of illness in the lying-in state the origin of which cannot otherwise be traced.

<p style="margin-left:0;">Septicæ-
mia from
contagion
conveyed
from other
puerperal
patients. The last source from which septic matter may be conveyed is from a patient suffering from puerperal septicæmia, a mode of origin which has, of late, attracted special attention. That this is the explanation of the occasional endemic prevalence of the disease in lying-in hospitals can scarcely be doubted. The theory of a special puerperal miasm pervading the hospital is not required to account for the facts, for there are a hundred ways, impossible to detect or avoid—on the hands of nurses or attendants, in sponges, bed-pans, sheets, or even suspended in the atmosphere—in which septic material, derived from one patient, may be carried to another.</p>

The poison may be conveyed, in the same manner, from one private patient to another. Of this there are many lamentable instances recorded. Thus it was mentioned by a gentleman at the recent discussion at the Obstetrical Society, that 5 out of 14 women he attended died, no other practitioner in the neighbourhood having a case. This origin of the disease was clearly pointed out by Gordon,[1] towards the end of last century, who stated that he himself 'was the means of carrying the infection to a great number of women,' and he also traced the spread of the disease in the same way in the practice of certain midwives. In some remarkable instances the unhappy property of carrying contagion has clung to individuals in a way which is most mysterious, and which has led to the supposition that the whole system becomes saturated with the poison. One of the strangest cases of this kind was that of Dr. Rutter, of Philadelphia, which caused much discussion. He had 45 cases of puerperal septicæmia in his own practice in one year, while none of his neighbours' patients were attacked. Of him it is related: 'Dr. Rutter, to rid himself of the mysterious influence which seemed to attend upon his practice, left the city for ten days, and before waiting on the next parturient case

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[1] See *Lectures on Puerperal Fever.* By Robert J. Lee, M.D.

had his hair shaved off, and put on a wig, took a hot bath, and changed every article of his apparel, taking nothing with him that he had worn or carried to his knowledge on any former occasion; and mark the result. The lady, notwithstanding that she had an easy parturition, was seized the next day with child-bed fever, and died on the eleventh day after the birth of the child. Two years later he made another attempt at self-purification, and the next case attended fell a victim to the same disease.' No wonder that Meigs, in commenting on such a history, refused to believe that the doctor carried the poison, and rather thought that he was 'merely unhappy in meeting with such accidents through God's providence.' It appears, however, that Dr. Rutter was the subject of a form of ozæna, and it is quite obvious that, under such circumstances, his hands could never have been free from septic matter.[1] This observation is of peculiar interest as showing that the sources of infection may exist in conditions difficult to suspect and impossible to obviate, and it affords a satisfactory explanation of a case which was for years considered puzzling in the extreme. It is quite possible that other similar cases, of which many are on record, although none so remarkable, may possibly have depended on some similar cause personal to the medical attendant.

The sources of septic poison being thus multifarious, a few words may be said as to the mode in which it may be conveyed to the patient.

As, on the view of puerperal septicæmia which seems most to agree with recorded facts, the poison, from whatever source it may be derived, must come into actual contact with lesions of continuity in the generative tract, it is obvious that one method of conveyance may be on the hands of the

Mode in which the poison may be conveyed to the patient.

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[1] This is stated on the authority of an obstetrical contemporary of Dr. Rutter. See *Amer. Journ. of Med. Science*, April 1875, p. 474.

The author quotes from the editor. Dr. Rutter had an ozæna which in time much disfigured him, from its effect upon the contour of his nose. He was unfortunately inoculated in his index finger from a patient, and neglected the pustule. He had 95 cases of puerperal septicæmia in four years and nine months, with 18 deaths. The question of Dr. Meigs, who was a noncontagionist in regard to puerperal peritonitis, was remarkably apposite, 'Did he distil a subtle essence which he carried with him?'—Harris, note to third American edition.

accoucheur. That this is a possibility, and that the disease
has often been unhappily conveyed in this way, no one can
doubt. Still it would be unfair in the extreme to conclude
that this is the only way in which infection may arise. In
town practice, especially, there are many other ways in
which septic matter may reach the patient. The nurse may
be the means of communication, and if she have been in
contact with septic matter, she is even more likely than the
medical attendant to convey it when washing the genitals
during the first few days after delivery, the time that absorp-
tion is most apt to occur. Barnes relates a whole series
of cases occurring in a suburb of London, in the practice of
different practitioners, every one of which was attended by
the same nurse. Again, septic matter may be carried in
sponges, linen, and other articles. What is more likely, for
example, than that a careless nurse might use an imperfectly
washed sponge, on which discharge has been allowed to
remain and decompose? Nor do I see any reason to question
the possibility of infection from septic matter suspended
in the atmosphere; and in lying-in hospitals, where many
women are congregated together, there can be little doubt
that this is a common origin of the disease. It is certain,
whatever view we may take of the character of the septic
material, that it must be in a state of very minute sub-
division, and there is no theoretical difficulty in the assump-
tion of its being conveyed by the atmosphere.

Conduct of the prac-titioner in relation to the disease. This question naturally involves a reference to the duty
of those who are unfortunately brought into contact with
septic matter in any form, either in a patient suffering
from puerperal septicæmia, zymotic disease, or offensive dis-
charges. The practitioner cannot always avoid such contact,
and it is practically impossible to relinquish obstetric work
every time that he is in attendance on a case from which
contagion may be carried. Nor do I believe, especially in
these days when the use of antiseptics is so well understood,
that it is essential. It was otherwise when antiseptics were
not employed; but I can scarcely conceive any case in which
the risk of infection cannot be prevented by proper care.
The danger I believe to be chiefly in not recognising the
possible risk, and in neglecting the use of proper pre-
cautions. It is impossible, therefore, to urge too strongly

the necessity of extreme and even exaggerated care in this direction. The practitioner should accustom himself, as much as possible, to use the left hand only in touching patients suffering from infectious diseases, as that which is not used, under ordinary circumstances, in obstetric manipulations. He should be most careful in the frequent employment of antiseptics in washing his hands, such as Condy's fluid, carbolic acid, or the 1 in 1,000 solution of perchloride of mercury. Clothing should be changed on leaving an infectious case. Much more care than is usually practised should be taken by nurses, especially in securing perfect cleanliness in everything brought into contact with the patient. When, however, a practitioner is in actual and constant attendance on a case of puerperal septicæmia, when he is visiting his patient many times a day, especially if he be himself washing out the uterus with antiseptic lotions, it is certain that he cannot deliver other patients with safety, and he should secure the assistance of a brother practitioner, although there seems no reason why he should not visit women already confined, in whom he has not to make vaginal examinations.

Importance of antiseptic precautions.

If the views here inculcated as to the nature of, and mode of infection in, puerperal septicæmia be correct, it is obvious that much may be done in the way of prophylaxis. A perfectly aseptic management of puerperal women is practically impossible. In many lying-in institutions on the Continent, and in some in this country, very rigid rules have been laid down to prevent the possibility of infective matter being conveyed to the patient either on the hands of the attendants, or on instruments, napkins, and the like, and it is said with very satisfactory results. As the risk is much greater when lying-in women are collected together, such precautions, which this is not the place to discuss, are absolutely indicated. They are not, however, applicable in ordinary private practice; but there are certain simple precautions which everyone might adopt without trouble, which will materially lessen the risk of septic poisoning. Amongst these may be indicated the use of antiseptic lotions, with which the practitioner and nurse should always wash their hands before attending any case, or touching the genital organs; the use of carbolised oil, 1 in 8, for lubricating the fingers, catheter,

Prophylaxis of septicæmia.

forceps, &c.; syringing out the vagina night and morning with diluted Condy's fluid; rigid attention to cleanliness in bedding, napkins, &c. Precautions such as these, although they may appear to some frivolous and useless, indicate a recognition of danger and an endeavour to remove it, and if they were generally inculcated on nurses (see note, pp. 279, 280) and others, might go far to prevent the occurrence of septic mischief.

Nature of the septic poison.

As to the precise character of the septic poison—although of late much has been said about it, and there is good reason to believe that further research may throw light on this obscure subject—too little is known to justify any positive statement. With regard to the influence of minute micro-organisms and their supposed connection with the production of the disease, this is especially the case. The recent researches of Heiberg, Von Recklinghausen, Steurer, and others, have shown that in puerperal septicæmia, as in surgical fever, erysipelas, and other infectious diseases, chain-like micrococci in large numbers may be traced passing between the muscular and connective tissue fibres, through the lymphatics, and thus into the general circulation, and that they may be found in various organs and pathological products. Various forms of micro-organisms have been detected in cases of puerperal septicæmia, such as the rod-like bacteria, the double diplococci, and the chain-like bacilli described by Doleris, which appear to be the most common. None of these, however, can be said to be pathognomonic of puerperal septicæmia. These observations are of much importance, as tending to confirm by scientific observation the intimate relation between these various forms of disease which has long been believed to exist. It may be taken as certain that these bodies bear an intimate and important relation to the disease; but whether they themselves form the septic matter, or carry it, or whether they are mere accidental concomitants of the pyæmic processes, it is impossible, in the present state of our knowledge, to state; and I, therefore, prefer to dwell on that part of the subject which is of clinical importance, rather than enter into speculative theories, which may to-morrow prove to be valueless.[1]

[1] For the latest information on this point see 'The Pathology of the Post-partum Uterus,' by J. Freeland Barbour, *Edin. Med. Journ.* 1885.

Passing on to the channels of diffusion through which the septic matter may act, we have to consider its effects on the structures with which it is brought into contact, and the mode in which it may infect the system at large ; and this will include a consideration of the pathological phenomena. Channels of diffusion.

Local changes consequent on the absorption of the poison are pretty constant, and of these we may form an intelligible idea by thinking of them as similar in character and causation to those which we have the opportunity of studying when septic matter is applied to a wound open to observation, as, for example, in cases of blood-poisoning following a dissection wound. Distinct traces of local action are not of invariable occurrence, and in some of the worst class of cases, when the amount of septic matter is great, and its absorption rapid, death may occur after an illness of short duration but great intensity, and before appreciable local changes, either at the site of absorption or in the system at large, have had time to develop themselves. The fact that puerperal fever may prove fatal, without leaving any tangible post-mortem signs, has often been pointed out, such cases most frequently occurring during the endemic prevalence of the disease in lying-in hospitals. There can be little doubt, however, that in such cases of intense septicæmia marked pathological changes exist in the form of alterations of the blood and degenerations of tissue, but not of a character which can be detected by an ordinary post-mortem examination. In the great majority of cases, indications of the disease exist at the site of absorption. These are described by pathologists as identical in their character with the inflammatory œdema which occurs in connection with phlegmonous erysipelas. If lacerations exist in the cervix or vagina, they take on unhealthy action, their edges swell, and their surfaces become covered with a yellowish coat, similar in appearance tð diphtheritic membrane. The mucous membrane of the uterus is also generally found to be affected, and in a degree varying with the intensity of the local septic process. There is evidence of severe endometritis ; and, very frequently, the whole lining of the uterus is profoundly altered, softened, covered with patches of diphtheritic deposit, and it may be in a state of general necrosis. In the severer cases these changes affect the muscular tissue of the uterus, which is

Local changes consequent on the absorption of the poison.

These are not always present.

Nature of local changes generally observed.

found to be swollen, soft, imperfectly contracted, and even partially necrosed, a condition which is likened by Heiberg to hospital gangrene. The connective tissue surrounding the generative tract is also swollen and œdematous, and the inflammation may in this way reach the peritoneum, although peritonitis, so often observed in puerperal septicæmia, does not necessarily depend on the direct transmission of inflammation from the pelvic connective tissue, but is more often a secondary phenomenon.

Channels through which systemic infection is produced.

Absorption through the lymphatics.

The channels through which general systemic infection may supervene are the lymphatics and the venous sinuses, the former being by far the most important. Recent researches have shown the great number and complexity of the lymphatics in connection with the pelvic viscera, and marked traces of the absorption of septic matter are almost always to be found, except in those very intense cases already alluded to, in which no appreciable post-mortem signs are discoverable. The septic matter is probably absorbed from the lymph spaces abounding in the connective tissue, and carried along the lymphatic canals to the nearest glands. The result is inflammation of their coats, and thrombosis of their contents, which may be seen on section as a creamy purulent substance. The absorption of septic material may, as Virchow has shown, be delayed by the local changes produced in the lymphatics and in the glands with which they communicate, which are, therefore, conservative in their action; and the further progress of the case may in this way be stopped, and local inflammation alone result, such cases being believed by Heiberg to be examples of abortive pyæmia. On the other hand, the free septic material may be too abundant and intense to be so arrested, it may pass on through the lymph canals and glands, until it reaches the blood-current through the thoracic duct, and so produces a general blood-infection. This mode of absorption of septic matter, and the tendency of the glands to arrest its further progress, serve to explain the progressive character of many cases, in which fresh exacerbations seem to occur from time to time; since fresh quantities of poison, generated at its source of origin, may be absorbed as the case progresses. The uterine veins are supposed by D'Espine to be the channel of absorption in the intense form of disease which

proves fatal very shortly after delivery, too soon for the more gradual process of lymphatic absorption to have become established. It is evident that the veins are not likely to act in this way, since they must, under ordinary circumstances, be completely occluded by thrombi, otherwise hæmorrhage would occur. If, however, uterine contraction be incomplete, the occlusion of the venous sinuses may be imperfect, and absorption of septic material through them may then take place. Some writers have laid great stress on imperfect uterine contraction in predisposing to septicæmia, and its influence may thus be well explained. The veins may bear an important part in the production of septicæmia, independent of the direct absorption of septic matter through them, by means of the detachment of minute portions of their occluding thrombi, in the form of emboli. If phlegmonous inflammation occur in the immediate vicinity of the veins, the thrombi they contain may become infected. When once blood-infection has occurred, by any of these channels, general septicæmia, the so-called puerperal fever, is developed.

Absorption through the veins.

Detachment of emboli from thrombi contained in the veins.

The variety of pathological phenomena found on post-mortem examination has had much to do with the prevalent confusion as to the nature of the disease. This has resulted in the description of many distinct forms of puerperal fever, the most marked pathological alteration having been taken to be the essential element of the disease. As a matter of fact there is no doubt that various types of pathological change are met with. Heiberg describes four chief classes which are by no means distinctly separated from one another, are often found simultaneously in the same subject, and are certainly not to be distinguished by the symptoms during life.

Pathological phenomena observed after general blood-infection.

Four principal types of pathological change.

Of these, the first is the class of cases in which no appreciable morbid phenomena are found after death. This formidable and fatal form of the disease has long been well known, and is that described by some of our authors as adynamic, or malignant puerperal fever. It is the variety which was so prevalent in our lying-in hospitals, and which Ramsbotham talks of as being second only to cholera in the severity and suddenness of its onset, and in the rapidity with which it carried off its victims. It is quite erroneous to suppose that the existence of pathological changes in this form of disease has never been recognised. Even with the

Intense cases without marked post-mortem signs.

coarse methods of examination formerly used, the occurrence of a fluid and altered state of the blood, and ecchymoses in connection with various organs—especially the lungs, spleen, and kidneys—were noticed and specially described by Copland in his 'Dictionary of Medicine.' More recently it has been clearly proved by the microscope that there exist, in addition, the commencement of inflammation in most of the tissues, shown by cloudy swellings, and granular infiltration and disintegration of the cell-elements; proving that the blood, heavily charged with septic matter, had set up morbid action wherever it circulated, the patient succumbing before this had time to develop.

Cases characterised by inflammation of the serous membranes.   In the second type, and that perhaps most commonly met with, the morbid changes are more frequently found in the serous membranes, in the pleura, the pericardium, but above all, the peritoneum, the alterations in which have long attracted notice, and have been taken by many writers as proving peritonitis to be the main element of the disease. Evidences of more or less peritonitis are very general. In the more severe cases there is little or no exudation of plastic lymph, such as is found in peritonitis unassociated with septicæmia. There is a greater or less quantity of brownish serum only, the coils of intestine, distended with flatus, and highly congested, being surrounded by it. More often there are patchy deposits of fibrinous exudation over many of the viscera, the fundus uteri, the under surface of the liver, and the distended intestines. There is then also a considerable quantity of sero-purulent fluid in the abdominal cavity. The pleural cavities may also exhibit similar traces of inflammatory action, containing imperfectly organised lymph, and sero-purulent fluid. Schroeder states that pleurisy is more often the direct result of transmission of inflammation through the substance of the diaphragm or lung, than a secondary consequence of the septicæmia. In like manner evidences of pericarditis may exist, the surface of the pericardium being highly injected, and its cavity containing serous fluid. Inflammation of the synovial membranes of the larger joints, occasionally ending in suppuration, is not uncommon and may probably be best included under this class of cases.

Cases characterised by changes   In the third type the mucous membranes appear to bear the brunt of the disease. The pathological changes are

most marked in the mucous membrane lining the intestines, in the
mucous
mem-
branes. which is highly congested and even ulcerated in patches, with numerous small spots of blood extravasated in the submucous tissue. Similar small apoplectic effusions have been observed in the substance of the kidneys, and under the mucous membrane of the bladder. Pneumonia is of common occurrence. In most cases it is probably secondary to the impaction of minute emboli in the smaller branches of the pulmonary artery; but it may doubtless arise from independent inflammation of the lung-tissue, and will then be included in the class of cases now under consideration.

The fourth class of pathological phenomena are those which are produced chiefly by the impaction of minute infected emboli in small vessels in various parts of the body. These are the cases which most closely resemble surgical pyæmia, both in their symptoms and post-mortem signs, and which by many writers are described under the name of puerperal pyæmia. The dependence of puerperal fever on phlebitis of the uterine veins was a favourite theory, and in a large proportion of cases the coats of the veins show signs of inflammation, their canals being occupied with thrombi in a more or less advanced state of disintegration. The mode in which these thrombi may become infected has been shown by Babnoff, who has proved that leucocytes may penetrate the coats of the vein, and entering its contained coagulum may set up disintegration and suppuration This observation brings these pyæmic forms of disease into close relation with septicæmia such as we have been studying, and justifies the conclusion of Verneuil that purulent infection is not a distinct disease, but only a termination of septicæmia, with which it ought to be studied. We have, moreover, to differentiate these results of embolism from those considered in a subsequent chapter, the characteristic of these cases being the infected nature of the minute emboli. Localised inflammations and abscesses, from the impaction of minute capillary emboli, are found in many parts of the body; most frequently in the lungs, then in the kidneys, spleen, and liver, and also in the muscles and connective tissues. Pathologists are by no means agreed as to the invariable dependence of these on embolism, nor is it possible to prove their origin from this source by post-mortem examination. Some

Cases cha
racterised
by the im
paction of
infected
emboli
and se
condary
inflamma
tion and
abscess.

attribute all such cases to embolism, others think that they may be the results of primary septicæmic inflammation. It has been proved by Weber that minute infected emboli may pass through the lung-capillaries; and this disposes of one argument against the embolic theory, based on the supposed impossibility of their passage. It is probable that both causes may operate, and that localised inflammations occurring a short time after delivery are directly produced by the infected blood, while those occurring after the lapse of some time, as in the second or third week, depend upon embolism.

Description of the disease.

From what has been said as to the mode of infection in puerperal septicæmia, and as to the very various pathological changes which accompany it, it will not be a matter of surprise to find that the symptoms are also very various in different cases. This can readily be explained by the amount and virulence of the poison absorbed, the channels of infection, and the organs which are chiefly implicated; but it renders it very difficult to describe the disease satisfactorily.

The symptoms generally show themselves within two or three days after delivery.

The symptoms generally show themselves within two or three days after delivery. As infection most often occurs during labour, or, in cases which are autogenetic, within a short time afterwards, and before the lesions of continuity in the generative tract have commenced to cicatrise, it can be understood why septicæmia rarely commences later than the fourth or fifth day.

The early symptoms are not well marked.

In the great majority of cases the disease begins insidiously. There are, generally, some chilliness and rigor, but by no means always, and even when present they frequently escape observation, or are referred to some transient cause. The first symptom which excites attention is a rise in the pulse, which may vary from 100 to 140 or more, according to the severity of the attack; and the thermometer will also show that the temperature is raised to 102°, or, in bad cases, even to 104° or 106°. Still, it must be borne in mind that both the pulse and temperature may be increased in the puerperal state from transient causes, and do not, of themselves, justify the diagnosis of septicæmia.

Symptoms of intense septicæmia.

In the more intense class of cases, in which the whole system seems overwhelmed with the severity of the attack, the disease progresses with great rapidity, and often without any appreciable indication of local complication. The pulse

PLATE VI.—TEMPERATURE CHARTS IN PUERPERAL SEPTICÆMIA.

FIG. 1.
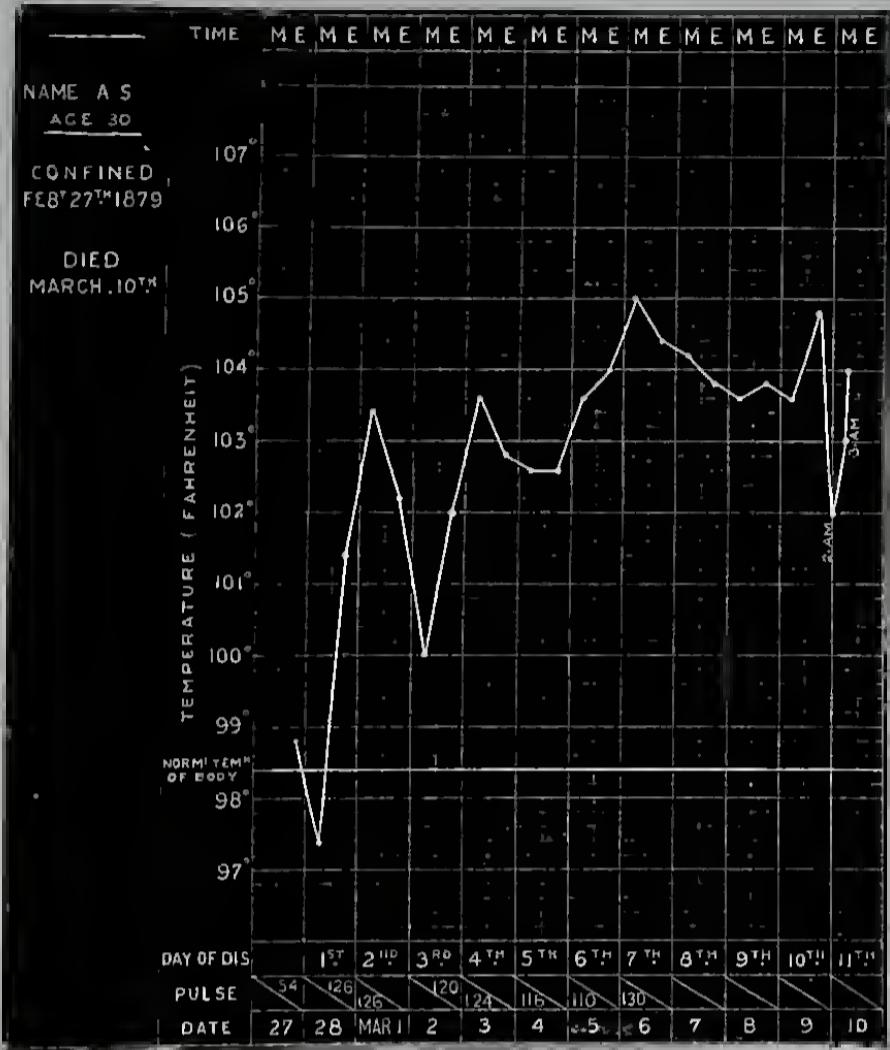
FIG. 2.
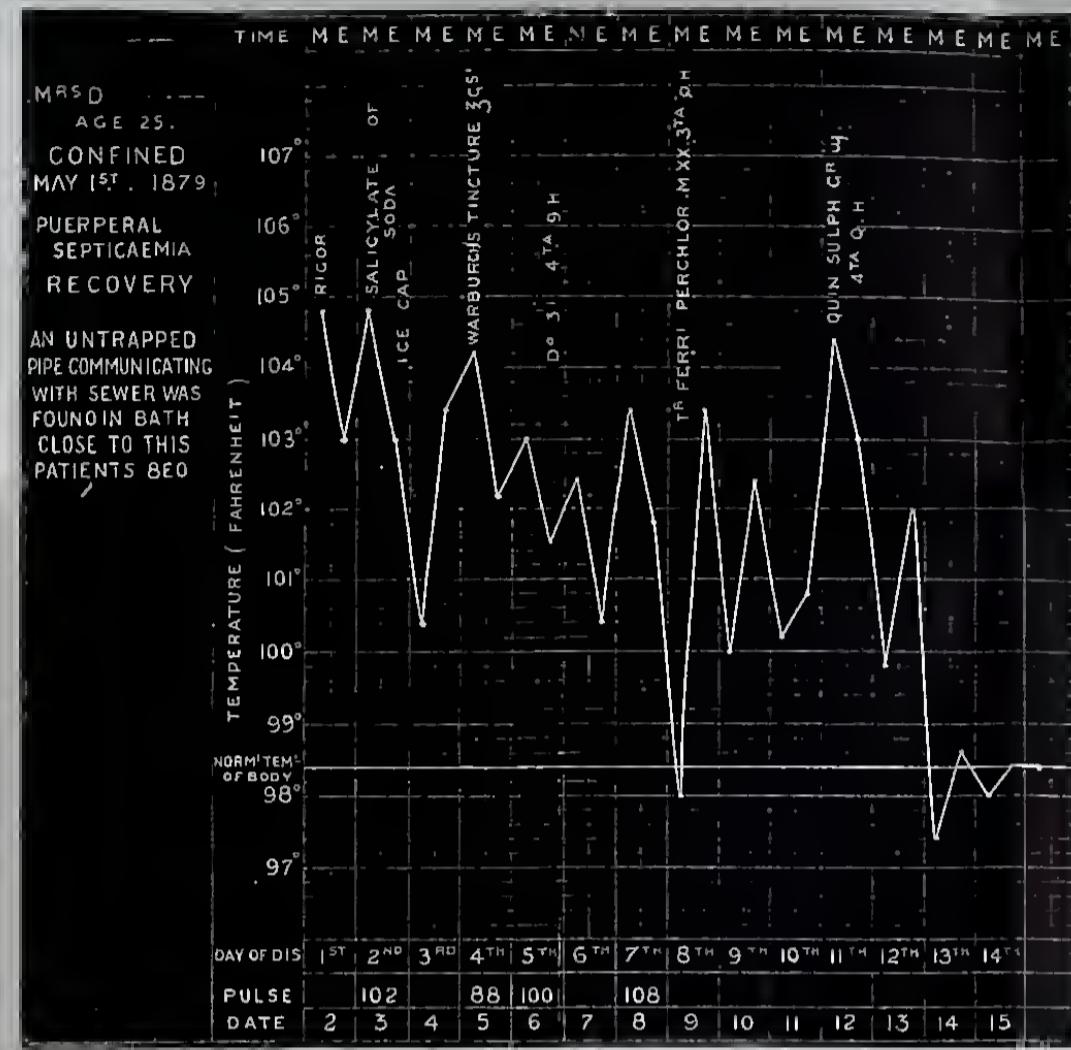
FIG. 3.
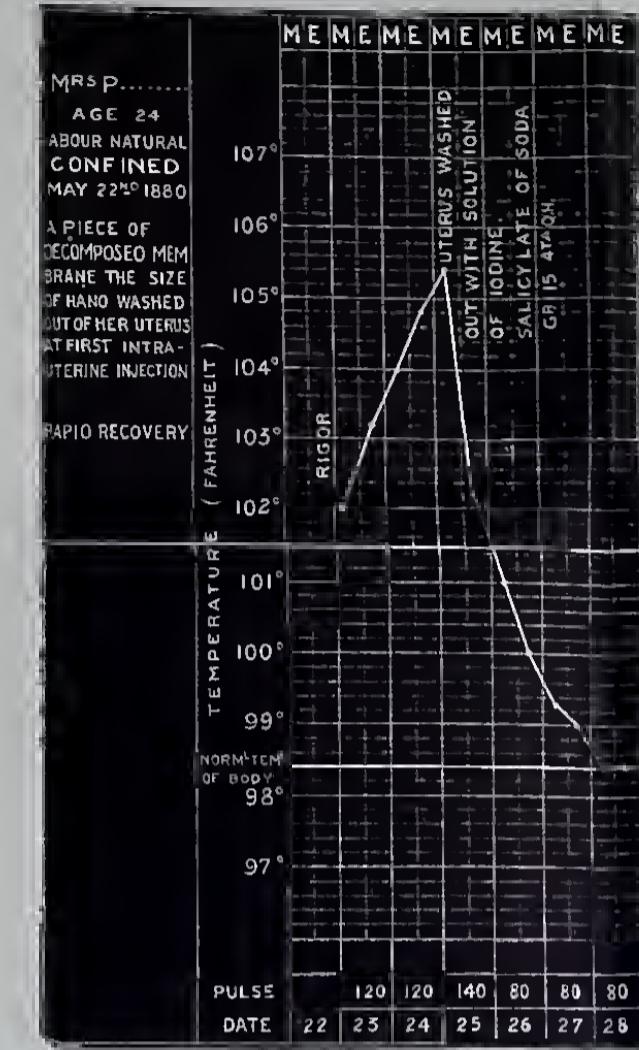
FIG. 4.
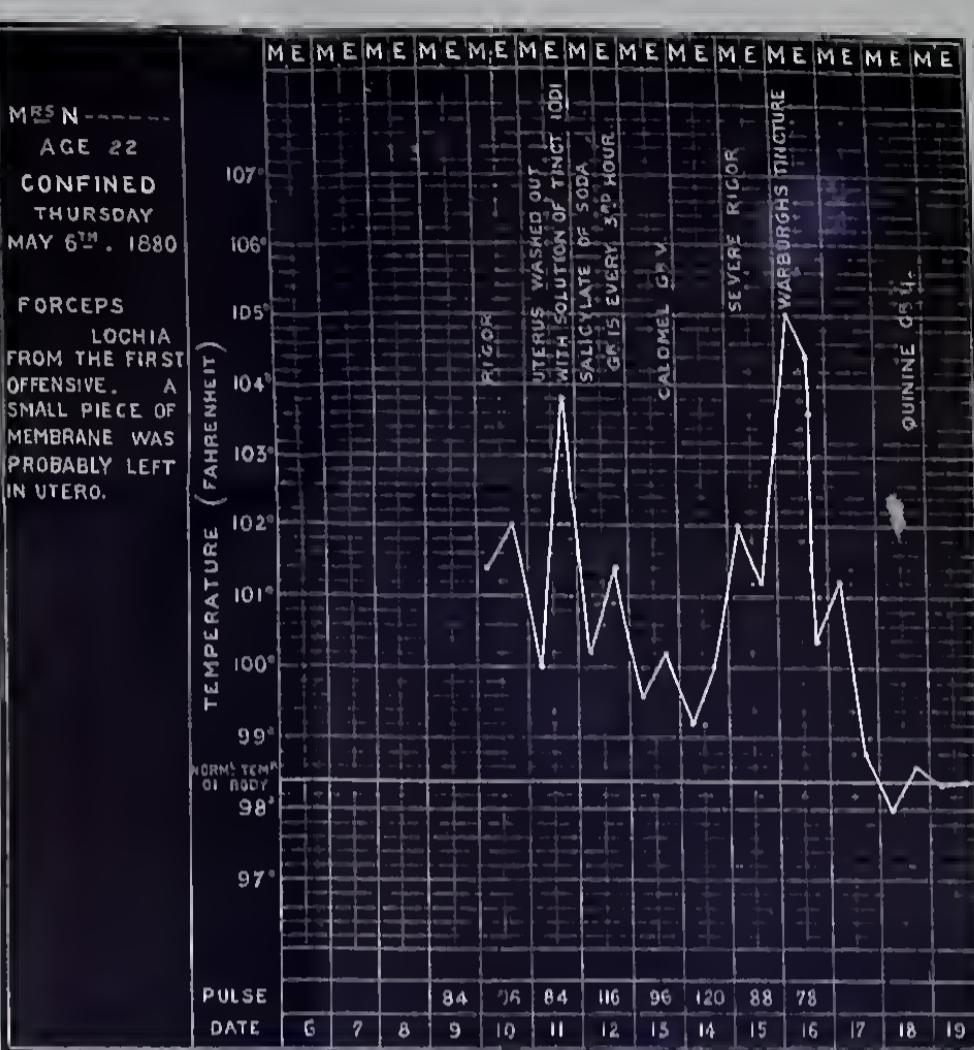
FIG. 5.
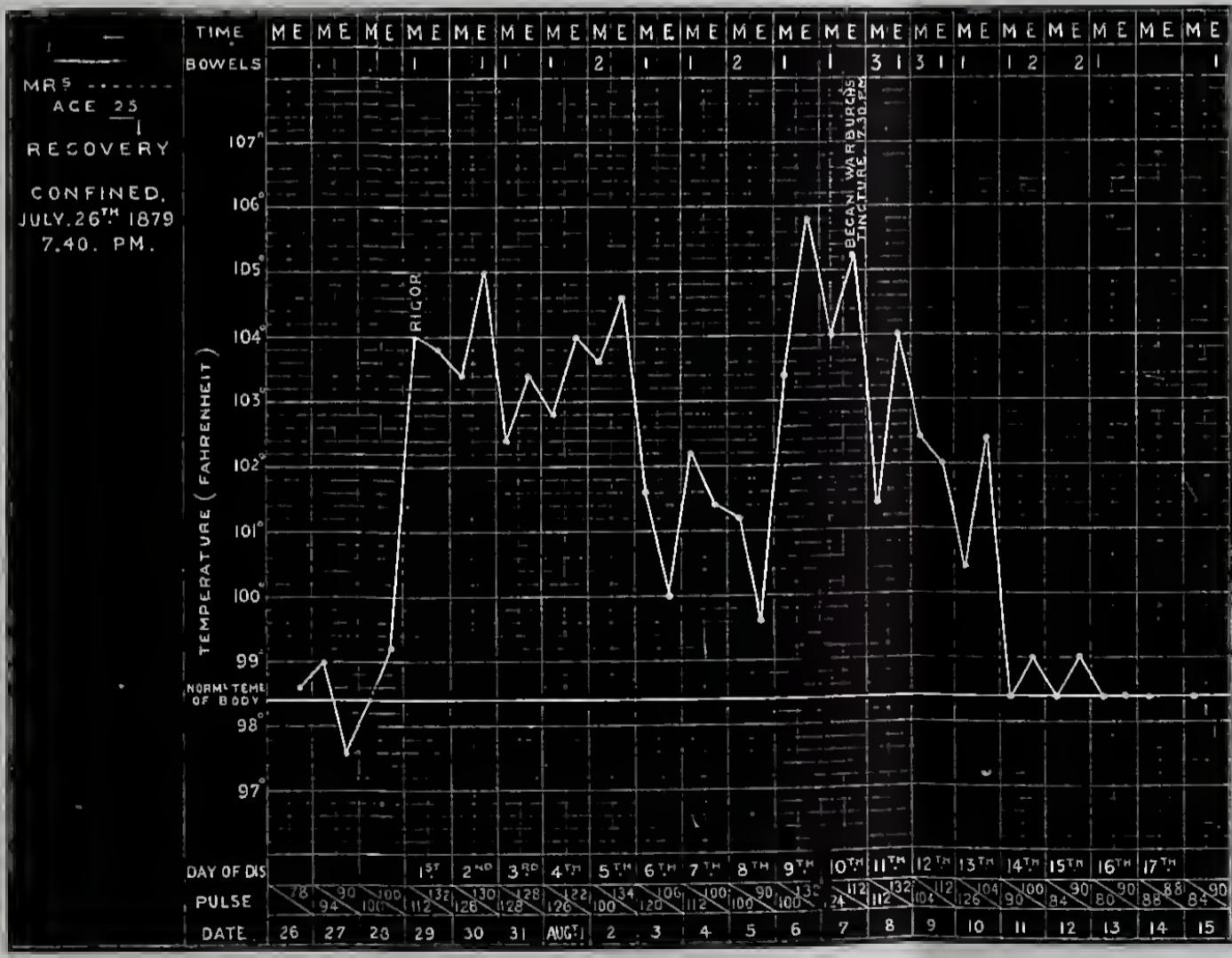
FIG. 6.
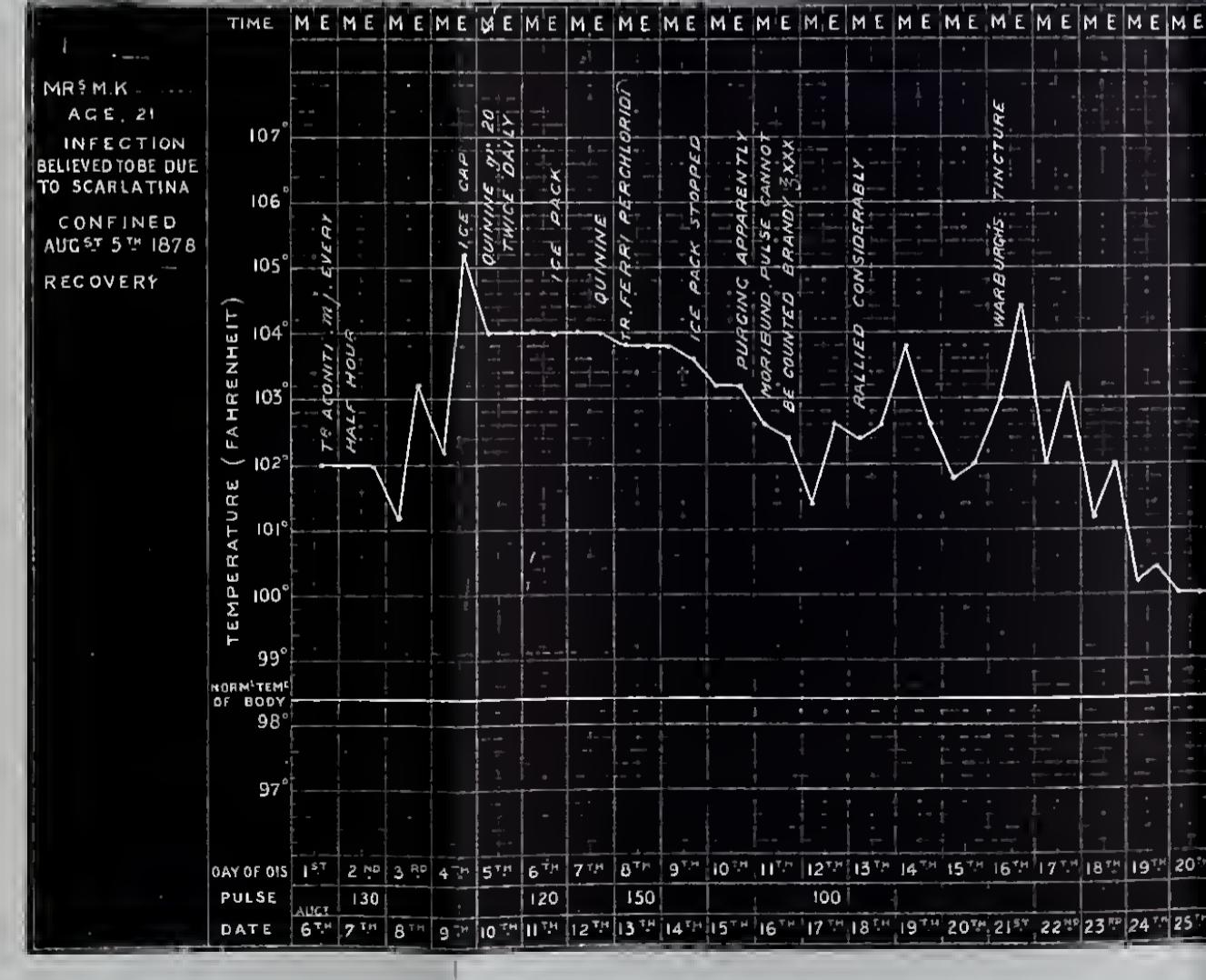
FIG. 7.
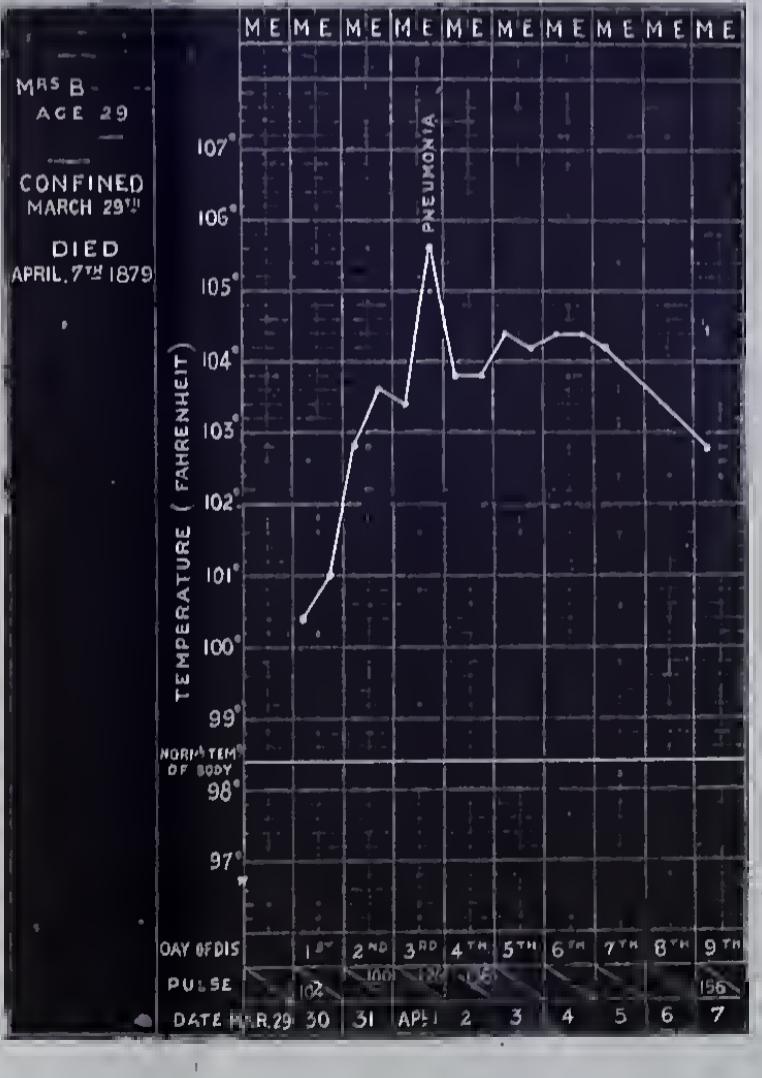
is very rapid, small, and feeble, varying from 120 to 140,
and there is generally a temperature of 103° to 104°. In
the worst form of cases the temperature is steadily high
without marked remissions (see Plate IV. Figs. 1, 6, and 7).
There may be little or no pain, or there may be slight tender-
ness on pressure over the abdomen or uterus; and, as the
disease progresses, the intestines get largely distended with
flatus, so that intense tympanites often form a most dis-
tressing symptom. The countenance is sallow, sunken, and
has a very anxious expression. As a rule, intelligence is un-
impaired, and this may be the case even in the worst forms
of the disease, and up to the period of death. At other
times there is a good deal of low muttering delirium, which
often occurs at night alone, and alternates with intervals of
complete consciousness, but is occasionally intensified, for a
short time, into a more acute form. Diarrhœa and vomiting
are of very frequent occurrence; by the latter, dark, gru-
mous, coffee-ground substances are ejected. The diarrhœa
is occasionally very profuse and uncontrollable; in mild cases
it seems to relieve the severity of the symptoms. The
tongue is moist, and loaded with sordes; but sometimes it
gets dark and dry, especially towards the termination of the
disease. The lochia are generally suppressed, or altered in
character, and sometimes they have a highly offensive odour,
especially when the disease is autogenetic. The breathing
is hurried and panting, and the breath itself has a very
characteristic, heavy, sweetish odour. The secretion of milk
is often, but not always, arrested.

With more or less of these symptoms the case goes on;
and when it ends fatally it generally does so within a week,
the fatal termination being indicated by more weakness,
rapid, threadlike, or intermittent pulse, marked delirium,
great tympanites, and sometimes a sudden fall of temperature,
until at last the patient sinks with all the symptoms of pro-
found exhaustion.

Duration of the disease.

In milder cases, similar symptoms, variously modified
and combined, are present. It is seldom that two precisely
similar cases are met with; in some, the rapid, weak pulse
is most marked; in others, abdominal distension, vomiting,
diarrhœa or delirium.

Variety of symptoms in dif- ferent cases.

Local complications variously modify the symptoms and

course of the disease. The most common is peritonitis, so much so that with some authors puerperal fever and puerperal peritonitis are synonymous terms. Here the first symptom is severe abdominal pain, commencing at the lower part of the abdomen, where the uterus is felt enlarged and tender. As the abdominal pain and tenderness spread, the sufferings of the patient greatly increase, the intestines become enormously distended with flatus, and the breathing is entirely thoracic, in consequence of the upward displacement of the diaphragm, and the fact that the abdominal muscles are instinctively kept as much in repose as possible. The patient lies on her back, with her knees drawn up, and sometimes cannot bear the slightest pressure of the bed-clothes. There is generally much vomiting, and often severe diarrhœa. The temperature generally ranges from 102° to 104°, or even 106°, and is subject to occasional exacerbations and remissions, possibly depending on fresh absorption of septic matter (see Plate IV. Figs 2, 4, and 5). The case generally lasts for a week or more, the symptoms going on from bad to worse, and the patient dying exhausted. D'Espine points out that rigors, with exacerbations of the general symptoms, not unfrequently occur about the sixth or seventh day, which he attributes to fresh systemic infection, from fœtid pus in the peritoneal cavity. It must not be supposed that all these symptoms are necessarily present when

Pain is not always present. the peritonitic complication exists. Pain is especially often entirely absent, and I have seen cases in which post-mortem examination proved the existence of peritonitis in a very marked degree, in which pain was entirely absent. Sometimes the pain is only slight, and amounts to little more than tenderness over the uterus.

Symptoms of other local complications. Symptoms of other local complications are characterised by their own special symptoms : thus pneumonia by dyspnœa, cough, dulness, &c. ; pericarditis by the characteristic rub ; pleurisy by dulness on percussion ; kidney affection by albuminuria, and the presence of casts ; liver complication by jaundice ; and so on.

Pyæmic forms of the disease. The course of the disease is not always so intense and rapid, being, in some cases, of a more chronic character, and lasting many weeks. The symptoms in the early stage are often indistinguishable from those already described, and it

is generally only after the second week that indications of purulent infection develop themselves. Then we often have recurrent and very severe rigors with marked elevations and remissions of temperature. At the same time there is generally an exacerbation of the general symptoms, a peculiar yellowish discolouration of the skin, and occasionally well-developed jaundice. Transient patches of erythema are not uncommonly observed on various parts of the skin, and such eruptions have often been mistaken for those of scarlet fever or other zymotic disease. Localised inflammations and suppuration may rapidly follow. Amongst the most common are inflammation or even suppuration of the joints—the knees, shoulders, or hips—which is preceded by difficulty of movement, swelling, and very acute pain. Large collections of pus in various parts of the muscles and connective tissues are not rare. Suppurative inflammation may also be found in connection with many organs, as in the eye, in the pleura, pericardium, or lungs ; each of which will, of course, give rise to characteristic symptoms, more or less modified by the type of the disease and the intensity of the inflammation.

There is a peculiar form of febrile disturbance which sometimes occurs in the puerperal state, and which is apt to be confounded with septicæmia, to which attention has recently been specially directed by Fordyce Barker,[1] under the name of ' Puerperal Malarial Fever.' It is specially apt to be met with in women who have been exposed to malarial poison during their former lives, the recurrence of the fever being probably determined by the puerperal state. Of this I have seen several very well-marked examples in ladies who have formerly contracted fever and ague in India. One of my patients, who has long been in India, and suffered from intermittent fever for years, is invariably attacked with it after delivery, and herself warned me of the fact the first time I attended her. The diagnosis is not always easy. Barker insists on the fact that puerperal malarial fever generally commences after the fifth day from delivery, while septicæmia almost always does so before that time. In the malarial fever, moreover, the intermissions are much more marked, while there are frequently recurring chills or rigors, which is not the case in septicæmia.

Puerperal malarial fever.

[1] ' Puerperal Malarial Fever,' *Amer. Journ. of Obstet.* April 1880.

Treat-
ment.

In considering the all-important subject of treatment, the views of the practitioner are naturally biassed by the theory he has adopted of the nature of the disease. If that here inculcated be correct, the indications we have to bear in mind are : 1st, to discover, if possible, the source of the poison, in the hope of arresting further septic absorption; 2nd, to keep the patient alive until the effects of the poison are worn off; and 3rd, to treat any local complication that may arise.

The use of
antiseptic
injections.

The first is likely to be of great importance in cases of self-infection, as fresh quantities of septic matter may be from time to time absorbed. We, fortunately, are in possession of a powerful means of preventing further absorption by the application of antiseptics to the interior of the uterus, and to the canal of the vagina. This is especially valuable when the existence of decomposing coagula, or other sources of septic matter, is suspected in the uterine cavity, or when offensive discharges are present. Disinfection is readily accomplished by washing out the uterine cavity, at least twice daily by means of a Higginson's syringe with a long vaginal pipe attached.[1] The results are sometimes very remarkable, the threatening symptoms rapidly disappearing, and the temperature and pulse falling as soon after the use of the antiseptic injections as to leave no doubt of the beneficial effects of the treatment. I cannot better illustrate the advantages of this treatment than by the following

[1] My colleague, Dr. Hayes, has invented a silver tube for the purpose of administering such intra-uterine injections (fig. 181), which answers its

Fig. 181.

HAYES'S TUBE FOR INTRA-UTERINE INJECTIONS.

purpose admirably. The numerous apertures at its extremity allow of a number of minute streams of fluid being thrown out in the form of a spray over the interior of the uterus, the complete bathing of its surface and washing out of its cavity being thus insured. It is, moreover, introduced more easily than the ordinary vaginal pipe, and can be attached to a Higginson syringe.

temperature chart, which is from a case which came under my observation in the out-door practice of King's College Hospital. It was that of a healthy woman, thirty-six years of age, who had an easy and natural labour. Nothing remarkable was observed until the third day after delivery, when the temperature was found to be slightly increased On the morning of the eighth day the temperature had risen to 105·8°.
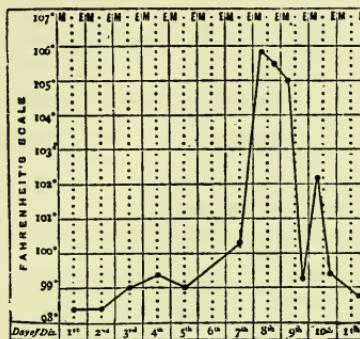
She was delirious, with a rapid thready pulse, clammy perspiration, tympanitic abdomen, and her general condition indicated the most urgent danger. On vaginal examination a piece of compressed and putrid placenta was found in the os. This was removed by my colleague, Dr. Hayes, and the uterus thoroughly washed out with Condy's fluid and water. The same evening the temperature had sunk to 99° and the general symptoms were much improved. The next day there was a slight return of offensive discharge, and an aggravation of the symptoms. After again washing out the uterus the temperature fell, and from that date the patient convalesced without a single bad symptom. (See also Plate IV. Fig. 3.)

This is a very well-marked example of the value of local antiseptic treatment, and I have seen many cases of the same kind. It should, therefore, never be omitted in all cases in which self-infection is possible ; and, indeed, even when there is no reason to suspect the presence of a local focus of infection, the use of antiseptic lotions is advisable, as a matter of precaution, since it can do no harm, and is generally comforting to the patient. Various antiseptics may be used, such as a weak solution of carbolic acid, 1 in 50, tincture of iodine dropped into warm water until it has a pale sherry colour, Condy's fluid largely diluted, or a solution of per-

chloride of mercury of the strength of 1 in 2,000. Of these the perchloride of mercury solution is the most effective germicide, and Koch's experiments have conclusively proved that it is the only recognised antiseptic which can be relied upon for destroying the spores of micro-organisms after a single application. As, however, there is a possibility that a too free and incautious use of the corrosive sublimate might prove poisonous, it would be well that such intra-uterine injections should not be stronger than 1 in 2,000, and that they should be practised by the medical man himself, the quantity for such irrigation not exceeding two quarts.[1] One or other of these may be advantageously used alternately—one in the morning, the other in the evening. Occasionally I have employed a 1 in 50 solution of carbolic acid, with about 5 grs. to the ounce of iodoform suspended in it. This has the advantage of not only being a powerful antiseptic, but of acting more continuously, in consequence of the powdered iodoform remaining partially attached to the uterine walls; or, as some have advised, an iodoform bougie[2] may be placed in the uterine cavity, or powdered iodoform insufflated through the cervix. The nozzle of the syringe should be guided well through the cervix, and the cavity of the uterus thoroughly washed out, until the fluid that issues from the vagina is no longer discoloured. As the os is always patulous, there is no risk of producing the troublesome symptoms of uterine colic, which occasionally follow the use of intra-uterine injections in the unimpregnated state. It is quite useless to entrust the injection to the nurse, and it should be performed at least twice daily by the practitioner himself, in all cases in which the discharges are offensive. It is not advisable, however, that such injections should be used indiscriminately, since they are not entirely free from risk, nor should they be continued for more than a few days. The vulva should, in all cases, be carefully inspected, with the view of ascertaining if the source of infection be not some local slough, or necrotic ulcer about the perinæum or orifice of the vagina, in which case its surface should be freely covered with iodoform. I have

[1] Herff, 'Ueber Ursachen und Verhütung der Sublimatsvergiftung, etc.' *Arch. f. Gynak.* vol. xxv. 1885.

[2] These may be made of gum arabic and glycerine, about $2\frac{1}{2}$ inches in length, each containing 90 grains of iodoform.

seen more than one instance in which this simple proce-
dure has sufficed to cut short symptoms of a very threaten-
ing character.

In a disease characterised by so marked a tendency to
prostration, the importance of sustaining the vital powers
by an abundance of easily assimilated nourishment cannot
be over-rated. Strong beef-tea, or other forms of animal
soup, milk, alone or mixed either with lime or soda-water,
and the yolk of eggs, beat up with milk and brandy, should
be given at short intervals, and in as large quantities as the
patient can be induced to take ; and the value of thoroughly
efficient nursing will be especially apparent in the manage-
ment of this important part of the treatment. As there
is frequently a tendency to nausea, the patient may resist
the administration of food, and the resources of the practi-
tioner will be taxed in administering it in such form and
variety as will prove least distasteful. Generally speaking,
not more than one or two hours should be allowed to elapse
without some nutriment being given. The amount of stimu-
lant required will vary with the intensity of the symptoms,
and the indications of debility. Generally, stimulants are
well borne, prove decidedly beneficial, and require to be
given pretty freely. In cases of moderate severity a table-
spoonful of good old brandy or whisky every four hours may
suffice ; but when the pulse is very rapid and thready, when
there is much low delirium, tympanites, or sweating (indicat-
ing profound exhaustion), it may be advisable to give them
in much larger quantities and at shorter intervals. The
careful practitioner will closely watch the effects produced,
and regulate the amount by the state of the patient, rather
than by any fixed rule ; but in severe cases eight or twelve
ounces of brandy, or even more, in the twenty-four hours
may be given with decided benefit.

*Adminis-
tration
of food
and stimu-
lants.*

Venesection, both general and local, was long considered
a sheet-anchor in this disease. Modern views are, however,
entirely opposed to its use ; and in a disease characterised
by so profound an alteration of the blood and so much pros-
tration, it is too dangerous a remedy to employ, although it is
possible that it might alleviate temporarily the severity of some
of the symptoms, especially in cases in which peritonitis is
well marked, and much local pain and tenderness are present.

*Venesec-
tion not
admis-
sible.*

Medicinal
treatment.

The rational indications in medicinal treatment are to lessen the force of the circulation as much as is possible without favouring exhaustion, and to diminish the temperature.

Use of
arterial
sedatives.

For the former purpose Barker strongly advocates the use of veratrum viride, in doses of five drops of the tincture every hour, until the pulse falls to below 100, when its effects are subsequently kept up by two or three drops every second hour.   Of this drug I have no personal experience ; but I have extensively used minute doses of tincture of aconite for the same purpose, and, when carefully given, I believe it to be a most valuable remedy.   The way I have administered it is to give a single drop of the tincture, at first every half-hour, increasing the interval of administration according to the effect produced.   Generally after giving four or five doses at intervals of half an hour, the pulse begins to fall, and afterwards a few doses at intervals of one or two hours will suffice to prevent the heart's action rising to its former rapidity.   The advantage of thus modifying cardiac action, with the view of preventing excessive waste of tissue, cannot

Caution
as to their
adminis-
tration.

be questioned.   It is evident that so powerful a remedy must not be used without the most careful supervision, for, if continued too long, or given at too frequent intervals, it may unduly depress the circulation, and do more harm than good.   It is necessary, therefore, that the practitioner should constantly watch the effect of the drug, and stop it if the pulse become very weak, or if it intermit.   It is most likely to be useful at an early stage of the disease before much exhaustion is present, and then only when the pulse is of a certain force and volume.   Barker says of the veratrum viride, what is also true of aconite, that ' it should not be given in those cases in which rapid prostration is manifested by a feeble, thread-like, irregular pulse, profuse sweats, and cold extremities.'

Reduction
of tempe-
rature.

The reduction of temperature must form an important part of our treatment, and for this purpose many agents are at our disposal.

Quinine.

Quinine in large doses, of from 10 to 30 grains, has been much used for this purpose, especially in Germany.   After its exhibition the temperature frequently falls one or two degrees.   It may be given morning and evening.   Unpleasant

head-symptoms, deafness, and ringing in the ears often render its continuance for a length of time impossible. These may, however, be much lessened by the addition of 10 to 15 minims of hydrobromic acid to each dose.

Antipyrine in doses of 20 grains every 3 or 4 hours sometimes proves very efficacious, but, as it is apt to depress, it should be combined with some stimulant such as 30 minims of sal-volatile. *Antipyrine.*

Salicylic acid, in doses of from 10 to 20 grains, or the salicylate of soda in the same doses, is a valuable antipyretic which I have found on the whole more manageable than quinine. Under its use the temperature often falls considerably in a short space of time. It is, however, apt to depress the circulation, and thus requires to be carefully watched while it is being administered; and, should the pulse become very small and feeble, it should be discontinued. *Salicylic acid.*

In some cases, especially when the fever has assumed a remittent type, I have administered, with marked benefit, a drug which is of high repute in India, in the worst class of malarious remittent fevers, and the almost marvellous effects of which in such cases I had myself witnessed in India many years ago. This is the so-called Warburg's tincture, the value of which has been testified to by many high authorities, among whom I many mention Dr. Maclean of Netley, Dr. Broadbent, and Sir Alexander Armstrong, the Director-General of the Medical Department of the Navy, who informs me that it is now supplied to all Her Majesty's ships in the tropics, because it is found to be of the utmost value in cases in which quinine has little or no effect. Recently its composition has been made public by Dr. Maclean. The basis is quinine, in combination with various aromatics and bitters, some of which probably intensify its action. Be this as it may, the testimony in favour of the anti-pyretic action of the remedy is very strong. I have found its exhibition followed by a profuse diaphoresis (this being its almost invariable effect), and sometimes a rapid amelioration of the symptoms. In other cases in which I have tried it, like everything else, it has proved of no avail. Of its use in ten malarial cases above alluded to Dr. Fordyce Barker says : ' For nearly two years past, in those cases where the stomach will tolerate it, I have found Warburg's tincture *Warburg's tincture.*

much more effective and speedy in producing the results desired than the largest doses of quinine.'[1]

Cold may be advantageously tried in suitable cases. The simplest mode of using it is by Thornton's ice-cap, by which a current of cold water is kept continuously running round the head. This has been found of great value in pyrexia after ovariotomy, and I have also found it useful as a means of reducing temperature in puerperal cases. It is a comforting application, and gives great relief to the throbbing headache, which often causes much suffering. Under its use the temperature often falls two or more degrees, and it is easily continued day and night.

In very serious cases, when the temperature reaches 105° and upwards, the external application of cold to the rest of the body may be tried. I have elsewhere related[2] a case of puerperal septicæmia with hyperpyrexia, the temperature continuously ranging over 105°, in which I kept the patient for eleven days nearly constantly covered with cloths soaked in iced water, by which means only was the temperature kept within moderate bounds, and life preserved. But this method of treatment is excessively troublesome, and is in no way curative. It is only of use in moderating the temperature when it has reached a point at which it could not continue long without destroying the patient. I should, therefore, never think of employing it unless the temperature was over 105°, and then only as a temporary expedient, requiring incessant watching, to be desisted from as soon as the temperature had reached a more moderate height. It is clearly impossible to place a puerperal patient in a bath, as is practised in hyperpyrexia associated with acute rheumatism or typhoid fever. The same effect may, however, be obtained by placing her on macintosh sheeting, or still better on a water-bed, into which cold water is run from time to time, and covering the body with towels soaked in iced water, which are frequently renewed by the attendant nurses. During the application the temperature should be constantly taken, and as soon as it has fallen to 101° the cold applications should be discontinued.

[1] *Op. cit.* p. 278.
[2] A Lecture on a case of Puerperal Septicæmia, with Hyperpyrexia, treated by the continuous application of cold.—*Brit. Med. Journ.* Nov. 17, 1877.

Amongst other remedies which have been used is tur- *Adminis-*
pentine, which was highly thought of by the Dublin school. *tration of*
turpen-
In cases with much tympanitic distension, and a small *tine.*
weak pulse, it is sometimes of unquestionable value, and
it probably acts as a strong nervine stimulant. Given in
doses of 15 to 20 minims, rubbed up with mucilage, it can
generally be taken in spite of its nauseous taste.

Purgatives, diaphoretics, or even emetics, have often *Evacuant*
been employed as eliminants of the poison. The former *remedies.*
are strongly recommended by Schroeder and other German
authorities, and in this country they were formerly amongst
the most favourite remedies, and there is a general concur-
rence of opinion amongst our older writers as to their value.
In the first volume of the ' Obstetrical Journal' there is a
paper by Mr. Morton, in which this practice is strongly
advocated, and some interesting cases are recorded in which
it apparently acted well. He administers calomel in doses
of 3 or 4 grains with compound extract of colocynth, so
as to keep up a free action of the bowels. It seems quite
reasonable, when there is constipation, to promote a gentle
action of the bowels by some mild aperient; but, bearing
in mind that severe and exhausting diarrhœa is a common
accompaniment of the disease, I should myself hesitate to
run the risk of inducing it artificially, especially as there is
no proof whatever that septic matter can really be eliminated
in this way. At the commencement of the disease, however,
I have often given one or two aperient doses of calomel with
decided benefit.

It is possible that further research will give us some *Internal*
means of counteracting the septic state of the blood; and *antiseptic*
remedies.
the sulphites and carbolates have been given for this purpose,
but as yet with no reliable results.

The tincture of the perchloride of iron naturally suggests *Tincture*
itself, from its well-known effects in surgical pyæmia. In *of per-*
chloride
the less intense forms of the disease, especially when local *of iron.*
suppurations exist, it is certainly useful, and may be given
in doses of 10 to 20 minims every three or four hours. In
very acute cases other remedies are more reliable, and the iron
has the disadvantage of not unfrequently causing nausea or
vomiting.

When restlessness, irritation, and want of sleep are *Opiates.*

prominent symptoms, sedatives may be required. Under such circumstances opiates may be given at night, and Battley's solution, nepenthe, or the hypodermic injection of morphia, are the forms which answer best.

Treat-
ment of
local com-
plications. Pain and tenderness, and local complications, must be treated on general principles. The distress from them is most experienced when peritonitis is well marked. Then warm and moist applications, in the form of poultices or fomentations, are very useful. Relief is also sometimes obtained from turpentine stupes, and, when the tympanites is distressing, turpentine enemata are very serviceable. I have found the free application over the abdomen of the flexible collodium of the Pharmacopœia decidedly useful in alleviating the suffering from peritonitis.

Such are the remedies most used in this disease. It is needless to say that it is quite impossible to lay down fixed rules for the management of any individual case; and it is obvious that, if puerperal septicæmia be not a special and distinct disease, its judicious treatment must depend on the general knowledge of the attendant, and on a careful study of the symptoms each separate case presents.

CHAPTER VI.

PUERPERAL VENOUS THROMBOSIS AND EMBOLISM.

UNDER the head of *thrombosis* we may class several impor- Puerperal
tant diseases connected with the puerperal state, which have thrombosis and
received far less attention than they deserve. It is only of its results.
late years that some, we may probably safely say the majority,
of those terribly sudden deaths which from time to time
occur after delivery have been traced to their true cause,
viz., obstruction of the right side of the heart and pulmonary
arteries from a blood-clot, either carried from a distance,
or, as I shall hope to show, formed *in situ*. Although the
result and, to a great extent, the symptoms, are identical in
both, still a careful consideration of the history of these two
classes of cases tends to show that in their causation they are
distinct, and that they ought not to be confounded. In the
former we have primarily a clotting of blood in some part of the
peripheral venous system, and the separation of a portion of
such a thrombus due to changes undergone during retrograde
metamorphosis tending to its eventual absorption. In the
latter we have a local deposition of fibrine, the result of blood
changes consequent on pregnancy and the puerperal state.
The formation of such a coagulum in vessels, the complete
obstruction of which is incompatible with life, explains the
fatal results. When, however, a coagulum chances to be
formed in more distant parts of the circulation, the vital
functions are not immediately interfered with, and we have
other phenomena occurring, due to the obstruction. The
disease known as phlegmasia dolens, I shall presently attempt Phlegma-
to show, is one result of blood-clot forming in peripheral sia dolens
vessels. But from the evident and tangible symptoms it one conse-
quence of
produces it has long been considered an essential and special peripheral
disease, and the general blood-dyscrasia which produces it, as throm-
bosis.
well as other allied states, has not been studied separately.

I shall hope to show that all these various conditions, dissimilar as they at first sight appear, are very closely connected, and that they are in fact due to a common cause; and thus, I think, we shall arrive at a clearer and more correct idea of their true nature, than if we looked upon them as distinct and separate affections, as has been commonly done. I am aware that in phlegmasia dolens, the pathology of which has received perhaps more study than that of almost any other puerperal affection, something beyond simple obstruction of the venous system of the affected limb is probably required to account for the peculiar tense and shining swelling which is so characteristic. Whether this be an obstruction of the lymphatics, as Dr. Tilbury Fox and others have maintained with much show of reason, or whether it is some as yet undiscovered state, further investigation is required to show. But it is beyond any doubt that the important and essential part of the disease is the presence of a thrombus in the vessels; and I think it will not be difficult to prove that in its causation and history it is precisely similar to the more serious cases in which the pulmonary arteries are involved.

It will be well to commence the study of the subject by a consideration of the conditions which, in the puerperal state, render the blood so peculiarly liable to coagulation, and we may then proceed to discuss the symptoms and results of the formation of coagula in various parts of the circulatory system.

Conditions which favour thrombosis.

The researches of Virchow, Benjamin Ball, Humphry, Richardson, and others have rendered us tolerably familiar with the conditions which favour the coagulation of the blood in the vessels. These are chiefly: 1. A stagnant or arrested circulation; as, for example, when the blood coagulates in the veins which draw blood from the gluteal region in old and bed-ridden people, or, as in some forms of pulmonary thrombosis, in which the clots in the arteries are probably the result of obstruction in the circulation through the lung-capillaries, as in certain cases of emphysema, pneumonia, or pulmonary apoplexy. 2. A mechanical obstruction around which coagula form, as in certain morbid states of the vessels, or, a better example still, secondary coagula which form around a travelled embolus impacted in the pulmonary arteries. 3. And, most important of all, in which the coagu-

lation is the result of some morbid state of the blood itself.
Examples of this last condition are frequently met with in
the course of various diseases, such as rheumatism or fever,
in which the quantity of fibrine is increased, and the blood
itself is loaded with morbid material. Thrombosis from this
cause is of by no means infrequent occurrence after severe
surgical operations, especially such as have been attended
with much hæmorrhage, or when the patient is in a weak
and anæmic condition. This has been specially dwelt upon,
as a not infrequent source of death after operation, by Fayrer
and other surgeons.[1]

But little consideration is required to show why throm-
bosis plays so important a part in the puerperal state, for
there most of the causes favouring its occurrence are present.
Probably there is no other condition in which they exist in so
marked a degree, or are so frequently combined. The blood
contains an excess of fibrine, which largely increases in the
latter months of utero-gestation, until, as has been pointed
out by Andral and Gavarret, it not unfrequently contains a
third more than the average amount present in the non-
pregnant state. As soon as delivery is completed, other
causes of blood-dyscrasia come into operation. Involution of
the largely hypertrophied uterus commences, and the blood
is charged with a quantity of effete material, which must
be present in greater or less amount, until that process is
completed. It is an old observation that phlegmasia dolens
is of very common occurrence in patients who have lost much
blood during labour. Thus Dr. Leishman says : 'In no class
of cases has it been so frequently observed as in women
whose strength has been reduced to a low ebb by hæmorrhage
either during or after labour ; and this, no doubt, accounts
for the observation made by Merriman, that it is relatively
a common occurrence after placenta prævia.'[2] An exami-
nation of the cases in which death results from pulmonary
thrombosis shows the same facts, as in a large proportion of
them severe post-partum hæmorrhage has occurred. The
exhaustion following the excessive losses so common after
labour must of itself strongly predispose to thrombosis,
and, indeed, loss of blood has been distinctly pointed out by

(margin note:) Condi-
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[1] *Edin. Med. Journ.* March 1861 ; *Indian Annals of Med.* July 1867.
[2] Leishman, *System of Obstetrics*, p. 710.

Richardson to be one of its most common antecedents. 'There is,' he observes, 'a condition which has been long known to favour coagulation and fibrinous deposition. I mean loss of blood, and syncope or exhaustion during impoverished states of the body.'

Since, then, so many of the predisposing causes of thrombosis are present in the puerperal state, it is hardly a matter of astonishment that it should be of frequent occurrence, or that it should lead to conditions of serious gravity. And yet the attention of the profession has been for the most part limited to a study of one only of the results of this tendency to blood-clotting after delivery, no doubt because of its comparative frequency and evident symptoms. True, the balance of professional opinion has lately held that phlegmasia dolens is chiefly the result of some morbid condition of the blood, producing plugging of the veins; but the wider view which I am attempting to maintain, which would bring this disease into close relation with the more rarely observed, but infinitely important, obstructions of the pulmonary arteries, has scarcely, if at all, been insisted on. Doubtless further investigation will show that it is not in these parts of the venous system alone that puerperal thrombosis occurs; but the symptoms and effects of venous obstruction elsewhere, important though they may be, are unknown.

Distinction between thrombosis and embolism. I propose, then, to describe the symptoms and pathology of blood-clot in the right side of the heart and pulmonary artery. It may be useful here to repeat that this is essentially distinct from embolism of the same parts. The latter is obstruction due to the impaction of a separated portion of a thrombus formed elsewhere, and for its production it is essential that thrombosis should have preceded it. Embolism is, in fact, an accident of thrombosis, not a primary affection. The condition we are now discussing I hold to be primary, precisely similar in its causation to the venous obstruction which, in other situations, gives rise to phlegmasia dolens.

Is primary thrombosis in the pulmonary arteries possible? At the threshold of this inquiry we have to meet the objection, started by several who have written on this subject,[1] that spontaneous coagulation of the blood, in the right side of the heart and pulmonary arteries, is a mechanical and physiological impossibility. This was the view of

[1] See especially Bertin, *Des Embolies*, p. 46 *et seq.*

Virchow, who, with his followers, maintained that, whenever death from pulmonary obstruction occurred, an embolus was of necessity the starting-point of the malady, and the nucleus round which secondary deposition of fibrine took place. Virchow holds that the primary factor in thrombosis is a stagnant state of the blood, and that the impulse imparted to the blood by the right ventricle is of itself sufficient to prevent coagulation. It is to be observed that these objections are purely theoretical. Without denying that there is considerable force in the arguments adduced, I think that the clinical history of these cases strongly favours the view of spontaneous coagulation; and I would apply to the theoretical objections advanced the argument used by one of their strongest upholders, with regard to another disputed point, ' Je préfère laisser la parole aux faits, car devant eux la théorie s'incline.' [1]

The anatomical arrangement of the pulmonary arteries shows how spontaneous coagulation may be favoured in them; for, as Dr. Humphry has pointed out,[2] ' the artery breaks up at once into a number of branches, which radiate from it, at different angles, to the several parts of the lungs. Consequently, a large extent of surface is presented to the blood, and there are numerous angular projections into the currents, both which conditions are calculated to induce the spontaneous coagulation of the fibrine.' We know, also, that thrombosis generally occurs in patients of feeble constitution, often debilitated by hæmorrhage, in whom the action of the heart is much weakened. These facts, of themselves, go far to meet the objections of those who deny the possibility of spontaneous coagulation at the roots of the pulmonary arteries.

The anatomical arrangement of the pulmonary arteries favours thrombosis.

The records of post-mortem examinations show also that in many of the cases the right side of the heart, as well as the larger branches of the pulmonary arteries, contained firm, leathery, decolourised, and laminated coagula, which could not have been recently formed. The advocates of the purely embolic theory maintain that these are secondary coagula, formed round an embolus. But surely the me-

Results of post-mortem examinations.

[1] Bertin, *Des Embolies*, p. 149.
[2] Humphry, *On the Coagulation of the Blood in the Venous System during Life.*

chanical causes which are sufficient to prevent spontaneous deposition of fibrine would also suffice to prevent its gathering round an embolus ; unless, indeed, the obstruction was sufficient to arrest the circulation altogether, when death would occur before there was any time for a secondary deposit. Before we can admit the possibility of embolism we must have at least one factor, that is, thrombosis, in a peripheral vessel, from which an embolus can come. In many of the recorded cases nothing of the kind was found, and although, as is argued, this may have been overlooked, yet such an oversight can hardly always have been made.

Clinical facts support this view.

The strongest argument, however, in favour of the spontaneous origin of pulmonary thrombosis is one which I originally pointed out in a series of papers ' On thrombosis and embolism of the pulmonary artery as a cause of death in the puerperal state.'[1] I there showed, from a careful analysis of 25 cases of sudden death after delivery, in which accurate post-mortem examinations had been made, that cases of spontaneous thrombosis and embolism may be divided from each other by a clear line of demarcation, depending on the period after delivery at which the fatal result occurs. In 7 out of these cases there was distinct evidence of embolism, and in them death occurred at a remote period after delivery ; in none before the nineteenth day. This contrasts remarkably with the cases in which the post-mortem examination afforded no evidence of embolism. These amounted to 15 out of the 25, and in all of them, with one exception, death occurred before the fourteenth day, often on the second or third. The reason of this seems to be that, in the former, time is required to admit of degenerative changes taking place in the deposited fibrine leading to separation of an embolus ; while in the latter the thrombosis corresponds in time, and to a great extent no doubt also in cause, to the original peripheral thrombosis from which, in the former, the embolus was derived. Many cases I have since collected illustrate the same rule in a very curious and instructive way.

Another clinical fact I have observed points to the same conclusion. In one or two cases distinct signs of pulmonary obstruction have shown themselves without proving imme-

[1] *Lancet*, 1867.

diately fatal, and shortly *afterwards* peripheral thrombosis, as evidenced by phlegmasia dolens of one extremity, has commenced. Here the peripheral thrombosis obviously followed the central, both being produced by identical causes, and the order of events, necessary to uphold the purely embolic theory, was reversed.

I hold, then, that those who deny the possibility of spontaneous coagulation in the heart and pulmonary arteries do so on insufficient grounds, and that we may consider it to be an occurrence, rare no doubt, but still sufficiently often met with, and certainly of sufficient importance, to merit very careful study.

Dr. Charles D. Meigs, of Philadelphia, was one of the first to direct attention to spontaneous coagulation of the blood in the right side of the heart and pulmonary arteries, as a cause of sudden death in the puerperal state. The occurrence itself, however, has been carefully studied by Paget, whose paper was published in 1855, four years before Meigs wrote on the subject.[1] It is true that none of Paget's cases happened after delivery, but he none the less clearly apprehended the nature of the obstruction. In 1855, Hecker[2] attributed the majority of these cases to embolism proper; and since that date most authors have taken the same view, believing that spontaneous coagulation only occurs in exceptional cases, such as those in which, on account of some obstruction in the lung or in the debility of the last few hours before death, coagula form in the smaller ramifications of the pulmonary arteries, and gradually creep backwards towards the heart.

History.

The symptoms can hardly be mistaken, and there seems to be no essential difference between the symptomatology of spontaneous and embolic obstructions, so that the same description will suffice for both. In a large proportion of cases the attack comes on with an appalling suddenness, which forms one of its most striking characteristics. Nothing in the condition of the patient need have given rise to the least suspicion of impending mischief, when, all at once, an intense and horrible dyspnœa comes on; she gasps and

Symptoms of pulmonary obstruction.

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[1] *Medico-Chir. Trans.* vol. xxvii. p. 162, and vol. xxviii. p. 352. *Philadelphia Medical Examiner*, 1849.

[2] *Deutsche Klinike*, 1855.

struggles for breath ; tears off the coverings from her chest in a vain endeavour to get more air ; and often dies in a few minutes, long before medical aid can be had, with all the symptoms of asphyxia. The muscles of the face and thorax are violently agitated in the attempt to oxygenate the blood, and an appearance closely resembling an epileptic convulsion may be presented. The face may be either pale or deeply cyanosed. Thus in one case I have elsewhere recorded, which was an undoubted example of true embolism, Mr. Pedler, the resident accoucheur at King's College Hospital, who was present during the attack, writes of the patient : [1] ' She was suffering from extreme dyspnœa, the countenance was excessively pale, her lips white, the face generally expressing deep anxiety.' In another, which was probably an example of spontaneous thrombosis,[2] occurring on the twelfth day after delivery, it is stated : ' The face had assumed a livid purple hue, which was so remarkable as to attract the attention both of the nurse and of her mother, who was with her.' The extreme embarrassment of the circulation is shown by the tumultuous and irregular action of the heart, in its endeavour to send the venous blood through the obstructed pulmonary arteries. Soon it gets exhausted, as shown by its feeble and fluttering beat. The pulse is thread-like, and nearly imperceptible, the respirations short and hurried, but air may be heard entering the lungs freely. The intelligence during the struggle is unimpaired ; and the dreadful consciousness of impending death adds not a little to the patient's sufferings, and to the terror of the scene. Such is an imperfect account of the symptoms, gathered from a record of what has been observed in fatal cases. It will be readily understood why, in the presence of so sudden and awful an attack, symptoms have not been recorded with the accuracy of ordinary clinical observation.

Is recovery possible ?   A question of great practical interest, which has been entirely overlooked by writers on the subject, is, Have we any ground for supposing that there is a possibility of recovery after symptoms of pulmonary obstruction have developed themselves ? That such a result must be of extreme rarity is beyond question ; but I have little doubt

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[1] *Brit. Med. Journ.* March 27, 1869.
[2] *Obst. Trans.* vol. xii. p. 194.

that in some few cases, entirely inexplicable on any other hypothesis, life is prolonged until the coagulum is absorbed, and the pulmonary circulation restored. In order to admit of this it is, of course, essential that the obstruction be not sufficient to prevent the passage of a certain quantity of blood to the lungs, to carry on the vital functions. The history of many cases tends to show that the obstructing clot was present for a considerable time before death, and that it was only when some sudden exertion was made, such as rising from bed or the like, calling for an increased supply of blood which could not pass through the secluded arteries, that fatal symptoms manifested themselves. This was long ago pointed out by Paget,[1] who says : ' The case proves that, in certain circumstances, a great part of the pulmonary circulation may be arrested in the course of a week (or a few days more or less), without immediate danger to life, or any indication of what had happened.' And after referring to some illustrative cases, ' Yet in all these cases the characters of the clots by which the pulmonary arteries were obstructed showed plainly that they had been a week or more in the process of formation.' If we admit the possibility of the continuance of life for a certain time, we must, I think, also admit the possibility, in a few rare cases, of eventual complete recovery. What is required is time for the absorption of the clot. In the peripheral venous system coagula are constantly removed by absorption. So strong, indeed, is the tendency to this, that Humphry observes with regard to it, ' It appears that the blood is almost sure to revert to its natural channel in process of time.'[2] If then the obstruction be only partial, if sufficient blood pass to keep the patient alive, and a sudden supply of oxygenated blood is not demanded by any exertion which the embarrassed circulation is unable to meet, it is not inconceivable that the patient may live until the obstruction is removed.

Such I believe to be the only explanation of certain cases, some of which, on any other hypothesis, it is impossible to understand. The symptoms are precisely those of pulmonary obstruction, and the description I have given above may be applied to them in every particular; and after repeated paroxysms, each of which seems to threaten imme-

Illustrative cases.

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[1] *Op. cit.* p. 358.   [2] *Med.-Chir. Trans.* vol. xxvii. p. 14.

diate dissolution, an eventual recovery takes place. What, then, I am entitled to ask, can the condition be, if not that which I suggest? As the question I am considering has never, so far as I am aware, been treated of by any other writer, I may be permitted to state, very briefly, the facts of one or two of the cases on which I found my argument, some of which I have already published in detail elsewhere.

K. H., delicate young lady. Labour easy. First child. Profuse post-partum hæmorrhage. Did well until the 7th day, during the whole of which she felt weak. Same day an alarming attack of dyspnœa came on. For several days she remained in a very critical condition, the slightest exertion bringing on the attacks. A slight blowing murmur heard for a few days at the base of the heart, and then disappeared. For two months patient remained in the same state. As long as she was in the recumbent position she felt pretty comfortable; but any attempt at sitting up in bed, or any unusual exertion, immediately brought on the embarrassed respiration. During all this time it was found necessary to administer stimulants profusely to ward off the attacks. Eventually the patient recovered completely.

Q. F., æt. 44. Mother of twelve children. Confined on July 6. On the 11th day she went to bed feeling well. There was no swelling or discomfort of any kind about the lower extremities at this time. About half-past 3 A.M. she was sitting up in bed, when she was suddenly attacked with an indescribable sense of oppression in the chest, and fell back in a semi-unconscious state, gasping for breath. She remained in a very critical condition, with the same symptoms of embarrassed respiration, for three days, when they gradually passed away. Two days *after* the attack phlegmasia dolens came on, the leg swelled, and remained so for several months.

This case is an example of the fact I have already referred to, of phlegmasia dolens coming on *after* the symptoms of pulmonary obstruction had manifested themselves; the inference being that both depended on similar causes operating on two distinct parts of the circulatory system.

C. H., æt. 24. Confined of her first child on August 20, 1867. Thirty hours after delivery she complained of great weakness and dyspnœa. This was alleviated by the treatment employed, but on the ninth day, after making a sudden exertion, the dyspnœa returned with increased violence, and continued unabated until I saw the patient on September 4, fourteen days after her confinement. The following are the notes of her condition, made at the time of the visit:—' I found her sitting on the sofa, propped up with pillows, as she said she could not breathe in the recumbent position. The least excitement or talking brought on the most aggravated dyspnœa, which was so bad as to threaten almost instant death. Her sufferings during these paroxysms were terrible to witness. She panted and struggled for breath, and her

chest heaved with short gasping respirations. She could not even bear anyone to stand in front of her, waving them away with her hand, and calling for more air. These attacks were very frequent, and were brought on by the most trivial causes. She talked in a low suppressed voice, as if she could not spare breath for articulation. On auscultation air was found to enter the lungs freely in every direction, both in front and behind. Immediately over the site of the pulmonary arteries there was a distinct harsh, rasping murmur, confined to a very limited space, and not propagated either upwards or downwards. The heart-sounds were feeble and tumultuous.' These symptoms led me to diagnose pulmonary obstruction, and I of course gave a most unfavourable prognosis, but to my great surprise the patient slowly recovered. I saw her again six weeks later, when her heart-sounds were regular and distinct, and the murmur had completely disappeared.

E. E., æt. 42, was confined for the first time on November 5, 1873, in the sixth month of utero-gestation. She had severe post-partum hæmorrhage, depending on partially adherent placenta, which was removed artificially. She did perfectly well until the 14th day after delivery, when she was suddenly attacked with intense dyspnœa, aggravated in paroxysms. Pulse pretty full, 130, but distinctly intermittent. Air entered lungs freely. The heart's action was fluttering and irregular, and, at the juncture of the fourth and fifth ribs with the sternum, there was a loud blowing systolic murmur. This was certainly non-existent before, as the heart had been carefully auscultated before administering chloroform during labour. For two days the patient remained in the same state, her death being almost momentarily expected. On the 21st, that is, two days *after* the appearance of the chest symptoms, phlegmasia dolens of a severe kind developed itself in the right thigh and leg. She continued in the same state for many days, lying more or less tranquilly, but having paroxysms of the most intense apnœa, varying from two to six or eight in the twenty-four hours. No one who saw her in one of these could have expected her to live through it. Shortly after the first appearance of the paroxysms it was observed that the cellular tissue of the neck and part of the face became swollen and œdematous, giving an appearance not unlike that of phlegmasia dolens. The attacks were always relieved by stimulants. These she incessantly called for, declaring that she felt they kept her alive. During all this time the mind was clear and collected. The pulse varied from 110 to' 130. Respirations about 60, temperature 101° to 102·5°. By slow degrees the patient seemed to be rallying. The paroxysms diminished in number, and after December 1st she never had another, and the breathing became free and easy. The pulse fell to 80, and the cardiac murmur entirely disappeared. The patient remained, however, very weak and feeble, and the debility seemed to increase. Towards the second week in December she became delirious, and died, apparently exhausted, without any fresh chest symptoms, on the 19th of that month. No post-mortem examination was allowed.

I have narrated this case, although it terminated fatally, because I hold it to be one of the class I am considering.

The death was certainly not due to the obstruction, all symptoms of which had disappeared, but apparently to exhaustion from the severity of the former illness. It illustrates, too, the simultaneous appearance of symptoms of pulmonary obstruction and peripheral thrombosis. The swelling of the neck was a curious symptom, which has not been recorded in any other cases, and may possibly be a further proof of the analogy between this condition and phlegmasia dolens.

Such cases can only depend on pulmonary obstruction.

Now, it may, of course, be argued that these cases do not prove my thesis, inasmuch as I only assume the presence of a coagulum. But I may fairly ask in return, what other condition could possibly explain the symptoms ? They are precisely those which are noticed in death from undoubted pulmonary obstruction. No one seeing one of them, or even reading an account of the symptoms, while ignorant of the result, could hesitate a single instant in the diagnosis. Surely, then, the inference is fair that they depended on the same cause. In the very nature of things my hypothesis cannot be verified by post-mortem examination ; but there is at least one case on record, in which, after similar symptoms, a clot was actually found. The case is related by Dr. Richardson.[1] It was that of a man who for weeks had symptoms precisely similar to those observed in the cases I have narrated. In one of his agonising struggles for breath he died, and after death it was found 'that a fibrinous band, having its hold in the ventricle, extended into the pulmonary artery.' This observation proves to a certainty that life may continue for weeks after deposition of a coagulum ; and, moreover, this condition was precisely what we should anticipate, since, of course, the obstructing coagulum must necessarily be small, otherwise the vital functions would be immediately arrested.

Cardiac murmurs in pulmonary obstruction.

There is a symptom noted in two of the above cases, and to a less extent in a third, which has not been mentioned in any account of fatal cases occurring after delivery, viz., a murmur over the site of the pulmonary arteries. It is a sign we should naturally expect, and very possibly it would be met with in fatal cases if attention were particularly directed to the point. In both these instances it was ex-

[1] *Clinical Essays*, p. 224 *et seq.*

ceedingly well marked, and in both it entirely disappeared when the symptoms abated. The probability of such a murmur being audible in cases of thrombosis of the pulmonary artery has been recognised by one of our highest authorities in cardiac disease, who actually observed it in a non-puerperal case. In the last edition of his work on diseases of the heart Dr. Walshe [1] says : ' The only physical condition connected with the vessel itself would probably be systolic basic murmur following the course of the pulmonary main trunk and of its immediate divisions to the left and right of the sternum. This sign I most certainly heard in an old gentleman whose life was brought to a sudden close, in the course of an acute affection, by coagulation in the pulmonary artery, and to a moderate extent in the right ventricle.'

Similar cases have, probably, been overlooked or mis-interpreted. Many seem to have been attributed to shock, in the absence of a better explanation, a condition to which they bear no kind of resemblance.

Causes of death.

The precise mode of death in pulmonary obstruction, whether dependent on thrombosis or embolism, has given rise to considerable difference of opinion. Virchow attributes it to syncope,[2] depending on stoppage of the cardiac contraction. Panum,[3] on the other hand, contests this view, maintaining that the heart continues to beat even after all signs of life have ceased. Certainly tumultuous and irregular pulsations of the heart are prominent symptoms in most of the recorded cases, and are not reconcilable with the idea of syncope. Panum's own theory is that death is the result of cerebral anæmia. Paget seems to think that the mode of death is altogether peculiar, in some respects resembling syncope, in others anæmia. Bertin, who has discussed the subject at great length, attributes the fatal result purely to asphyxia. The condition, indeed, is in all respects similar to that state ; the oxygenation of the blood being prevented, not because air cannot get to the blood, but because blood cannot get to the air. The symptoms also seem best explained by this theory ; the intense dyspnœa, the terrible struggle for air, the preservation of intelligence, the tumultuous action of

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[1] Walshe, *On Diseases of the Heart*, 4th ed. 1873.

[2] *Gesamm. Abhandl.* 1862, p. 316.   [3] Virchow's *Archiv.* 1863.

the heart, are certainly not characteristic either of syncope or anæmia.

The anatomical character of the clots seems to vary considerably. Ball, by whom they have been most carefully described, believes that they generally commence in the smaller ramifications of the arteries, extending backwards towards the heart, and filling the vessels more or less completely. Towards its cardiac extremity the coagulum terminates in a rounded head, in which respect it resembles those spontaneously formed in the peripheral veins. It is non-adherent to the coats of the vessels, and the blood circulates, when it can do so at all, between it and the vascular walls. Such clots are white, dense, and of a homogeneous structure, consisting of layers of decolourised fibrine, firm at the periphery, where the fibrine has been most recently deposited, and softened in the centre, where amylaceous or fatty degeneration has commenced. Ball maintains that if the coagulum have commenced in the larger branches of the arteries, it must have first begun in the ventricle, and extended into them. According to Humphry the same changes take place in pulmonary as in peripheral thrombi, and they may become adherent to the walls of the vessels, or converted into threads or bands. When the obstruction is due to embolism, provided the case is a well-marked one, and the embolus of some size, the appearances presented are different. We have no longer a laminated and decolourised coagulum, with a rounded head, similar to a peripheral thrombus. The obstruction in this case generally takes place at the point of bifurcation of the artery, and we there meet with a greyish-white mass, contrasting remarkably with the more recently deposited fibrine before and behind it. It may be that the form of the embolus shows that it has recently been separated from a clot elsewhere; and in many cases it has been possible to fit the travelled portion to the extremity of the clot from which it has been broken. We may also, perhaps, find that the embolus has undergone an amount of retrograde metamorphosis corresponding with that of the peripheral thrombus from which we suppose it to have come, but differing from that of the more recently deposited fibrine around it. It must be admitted, however, that the anatomical peculiarities of the coagula will by no means

always enable us to trace them to their true origin. In many cases emboli may escape detection from their smallness, or from the quantity of fibrine surrounding them.

But few words need be said as to the treatment of pulmonary obstruction. In a large majority of cases the fatal result so rapidly follows the appearance of the symptoms, that no time is given us even to make an attempt to alleviate the patient's sufferings. Should we meet with a case not immediately fatal, it seems that there are but two indications of treatment affording the slightest rational ground of hope. *Treatment.*

1. To keep the patient alive by the administration of stimulants—brandy, ether, ammonia, and the like—to be repeated at intervals corresponding to the intensity of the paroxysms and the results produced. In the cases I have above narrated, in which recovery ensued, this took the place of all other medication. Possibly leeches, or dry cupping to the chest, might prove of some service in relieving the circulation.

2. To enjoin the most absolute and complete repose. The object of this is evident. The only chance for the patient seems to be, that the vital functions should be carried on until the coagulum has been absorbed, or at least until it has been so much lessened in size as to admit of blood passing it to the lungs. The slightest movements may give rise to a fatal paroxysm of dyspnœa, from the increased supply of oxygenated blood required. It must not be forgotten that in a large proportion of cases death immediately followed some exertion in itself trivial, such as rising out of bed. Too much attention, then, cannot be given to this point. The patient should be absolutely still; she should be fed with abundance of fluid food, such as milk, strong soups, and the like; and should on no account be permitted to raise herself in bed, or attempt the slightest muscular exertion. If we are fortunate enough to meet with a case apparently tending to recovery, these precautions must be carried on long after the severity of the symptoms has lessened, for a moment's imprudence may suffice to bring them back in all their original intensity.

Bertin,[1] indeed, recommends a system of treatment very

[1] *Op. cit.* p. 393.

different from this. In the vain hope that the violent effort induced may cause the displacement of the impacted embolus (to which alone he attributes pulmonary obstruction), he recommends the administration of emetics. Few, I fancy, will be found bold enough to attempt so hazardous a plan of treatment.

Various drugs have been suggested in these cases. Richardson [1] recommended ammonia, a deficiency of which he at that time believed to be the chief cause of coagulation. He has since advised that liquor ammoniæ should be given in large doses, 20 minims every hour, in the hope of causing solution of the deposited fibrine; and he has stated that he has seen good results from the practice. Others advise the administration of alkalies, in the hope that they may favour absorption. The best that can be said for them is that they are not likely to do much harm.

Puerperal pleuro-pneumonia.

This is, perhaps, the best place to mention an important, but little understood, class of cases which I believe to be less uncommon than is generally supposed. I refer to severe pleuro-pneumonia occurring in connection with the puerperal state, but not distinctly associated with septicæmia. Two carefully observed cases of this kind are recorded by MacDonald, occurring in his practice; I myself have met with three very marked examples within the past three years, one of which proved fatal, the other two giving rise to most serious illness, from which the patient recovered with difficulty.

Peculiarities of these cases.

So far as my own observation goes there are marked peculiarities in such cases which clearly differentiate them from the ordinary course of pneumonia. The onset is sudden, and unconnected with exposure to cold or other cause of lung disease; there is no definite crisis, but a continuous pyrexia, of moderate intensity, lasting a variable time; and the physical signs differ from those of ordinary pneumonia.

Physical signs.

In MacDonald's case, as well as in my own, they were peculiar in this respect, that there was very slight crepitation, marked rusty sputum, and a wooden dulness, much more intense than in ordinary pneumonia, extending over a large lung space, with a very slight entrance of air into the lung tissue. It is also remarkable that a very large proportion of

[1] *Heart Disease during Pregnancy*, p. 209.

the cases was associated with phlegmasia dolens. Thus it existed in one of MacDonald's two cases, and in two out of my own three. Like phlegmasia dolens, moreover, the disease generally commenced some weeks after delivery ; my own cases, for example, occurred respectively 15, 28, and 35 days after labour. It is difficult to believe that there is not some connection between these two conditions, and there is much in their peculiar history to lead to the belief that such forms of lung disease depend, in fact, on the thrombotic or embolic obstruction of the minute branches of the pulmonary arteries, caused by conditions similar to those which have produced the phlebitic obstructions in the lower extremities. In the absence of careful post-mortem examination this hypothesis is clearly not susceptible of proof. MacDonald, while admitting that 'a limited thrombosis of the pulmonary arteries would no doubt explain the facts of the cases,' is rather inclined to 'seek the chief explanation of their occurrence in the alterations which the pregnant and puerperal conditions impress upon the blood and the blood vascular system.'

I confess that to my mind the former hypothesis is not only the most definite, but the one which most readily explains all the peculiarities of these cases. I cannot, however, do more than suggest it, in the hope that further observations, and especially carefully conducted autopsies, may throw some light on this obscure and little studied subject.

As regards treatment, it is obvious that it must be conducted on general principles, carefully avoiding over-severe measures, and supporting the patient through a trial to the system that must necessarily be severe.

Marginal notes:

Connection with phlegmasia dolens.

Probable dependence on thrombotic or embolic obstruction of the pulmonary arteries.

Treatment.

CHAPTER VII.

PUERPERAL ARTERIAL THROMBOSIS AND EMBOLISM.

Arterial thrombosis and embolism. THE same condition of the blood which so strongly predisposes to coagulation in the vessels through which venous blood circulates tends to similar results in the arterial system. These, however, are by no means so common, and do not, as a rule, lead to such important consequences. The subject has been but little studied, and almost all our knowledge of it is derived from a very interesting essay by Sir James Simpson.[1] As I have devoted so much space to the consideration of venous thrombosis and embolism I shall but briefly consider the effects of arterial obstruction.

Causes. In a considerable number of recorded cases the obstruction has resulted from the detachment of vegetations deposited on the cardiac valves, the result of endocarditis, either produced by antecedent rheumatism, or as a complication of the puerperal state. Sometimes the obstruction seems to depend on some general blood dyscrasia, similar to that producing venous thrombosis, or on some local change in the artery itself. Thus Simpson records a case apparently produced by local arteritis, which caused acute gangrene of both lower extremities, ending fatally in the third week after delivery. In other cases it has been attributed to coagulation following spontaneous laceration and corrugation of the internal coat of the artery.

Symptoms. The symptoms of puerperal arterial obstruction must, of course, vary with the particular arteries affected. Those with the obstruction of which we are most familiar are the cerebral, the brachial, and the femoral. The effects produced must also be modified by the size of the embolus, and the more or less complete obstruction it produces. Thus, for

[1] *Selected Obst. Works*, vol. i. p. 523.

example, if the middle cerebral artery be blocked up entirely, the functions of those portions of the brain supplied by it will be more or less completely arrested, and hemiplegia of the opposite side of the body, followed by softening of the brain-texture, will probably result. If the nervous symptoms be developed gradually, or increase in intensity after their first appearance, it may be that an obstruction, at first incomplete, has increased by the deposition of fibrine around it. So the occasional sudden supervention of blindness, with destruction of the eyeball—cases of which are recorded by Simpson—not improbably depend on the occlusion of the ophthalmic artery, the function of the organ depending on its supply through the single artery. The effects of obstruction of the visceral arteries in the puerperal state are entirely unknown; but it is far from unlikely that further investigation may prove them to be of great importance. In the extremities arterial obstruction produces effects which are well marked. They are classified by Simpson under the following heads :—1. *Arrest of pulse below the site of obstruction.*—This has been observed to come on either suddenly or gradually, and, if the occlusion be in one of the large arterial trunks, it is a symptom which a careful examination will readily enable us to detect. 2. *Increased force of pulsation in the arteries above the seat of obstruction.* 3. *Fall in the temperature of the limb.*—This is a symptom which is easily appreciable by the thermometer, and when the main artery of the limb is occluded the coldness of the extremity is well-marked. 4. *Lesions of motor and sensory functions, paralysis, neuralgia, &c. &c.*— Loss of power in the affected limb is often a prominent symptom, and when it comes on suddenly, and is complete, the main artery will probably be occluded. It may be diagnosed from paralysis depending on cerebral or spinal causes by the absence of head symptoms, by the history of the attack, and by the presence of other indications of arterial obstruction, such as loss of pulsation in the artery, fall of temperature, &c. The sensory functions in these cases are generally also seriously disturbed, not so much by loss of sensation as by severe pain and neuralgia. Sometimes the pain has been excessive, and occasionally it has been the first symptom which directed attention to the state of the limb. 5. *Gangrene below or*

beyond the seat of arterial obstruction.—Several interesting cases are recorded, in which gangrene has followed arterial obstruction. Generally speaking, gangrene will not follow occlusion of the main arterial trunk of an extremity, as the collateral circulation becomes soon sufficiently developed to maintain its vitality. In many of the cases either thrombi have obstructed the channels of collateral circulation as well or the veins of the limb have also been blocked up. When such extensive obstructions occur they obviously cannot be embolic, but must depend on a local thrombosis, traceable to some general blood dyscrasia depending on the puerperal state.

Treat-
ment.

Little can be said as to the treatment of such cases, which must vary with the gravity and nature of the symptoms in each. Beyond absolute rest (in the hope of eventual absorption of the thrombus or embolus), generous diet, attention to the general health of the patient and sedative applications to relieve the local pain, there is little in our power. Should gangrene of an extremity supervene in a puerperal patient, the case must necessarily be well-nigh hopeless. Simpson, however, records one instance in which amputation was performed above the line of demarcation, the patient eventually recovering.

CHAPTER VIII.

OTHER CAUSES OF SUDDEN DEATH DURING LABOUR
AND THE PUERPERAL STATE.

A LARGE number of the cases in which sudden death occurs during or after delivery find their explanation, as I have already pointed out, in thrombosis or embolism of the heart and pulmonary arteries. Probably many cases of the so-called *idiopathic asphyxia* were, in fact, examples of this accident, the true nature of which had been misunderstood. Besides these, there are, no doubt, many other conditions which may lead to a suddenly fatal result in connection with parturition. *Various causes of sudden death.*

Some of these are of an organic, others of a functional nature.

Among the former may be mentioned cases in which the straining efforts of the second stage of labour have produced death in patients suffering from some pre-existent disease of the heart. Rupture of that organ has probably occurred from fatty degeneration of its walls. Dehous [1] narrates an instance in which the efforts of labour caused the rupture of an aneurysm. Another case, from interference with the action of the heart in a patient who had pericardial effusion, is narrated by Ramsbotham. Dr. Devilliers relates an instance occurring in a young woman during the second stage of labour. The heart was found to be healthy, but the lungs were intensely congested, and blood was extensively extravasated all through their texture. This was probably caused by pulmonary congestion and apoplexy, produced by the severe straining efforts. Many cases from effusion of blood into the brain-substance, or on its surface, are on record, no doubt in patients who, from arterial degeneration or other *Organic causes.*

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[1] Dehous, *Sur les Morts subites.*

causes, were predisposed to apoplectic effusions. The so-called apoplectic convulsions, formerly described in most works on obstetrics as a variety of puerperal convulsions, are evidently nothing more than apoplexy coming on during or after labour. As regards their pathology, they do not seem to differ from ordinary cases of apoplexy in the non-pregnant condition. One example is recorded of death which was attributed to rupture of the diaphragm, from excessive action in the second stage.

Func-
tional
causes. Among the causes of death which cannot be traced to some distinct organic lesion may be classed cases of syncope, shock, and exhaustion. Many instances of this kind are recorded. Thus in some women of susceptible nervous organisation the severity of the suffering appears to bring on a condition similar to that produced by excessive shock or exhaustion, which has not unfrequently proved fatal. Several examples of this kind have been cited by McClintock.[1] It is also not unlikely that sudden syncope sometimes produces a fatal result, during or after labour. Most cases of death, otherwise inexplicable, used to be referred to this cause; but accurate autopsies were seldom made, and even when they were—the important effects of pulmonary coagula being unknown—it is more than probable that the true cause of death was overlooked. It has been supposed that the sudden removal of pressure from the veins of the abdomen, by the emptying of the gravid uterus after delivery, may favour an increased afflux of blood into the lower parts of the body, and thus tend to an anæmic condition of the brain, and the production of syncope. However this may be, the possibility of its occurrence, and its manifest danger in a recently delivered woman, are sufficient reasons for enforcing the recumbent position after labour is over. In some of the cases the syncope was evidently produced by the patient's suddenly sitting upright.

Death
from air
in the
veins. Some cases of sudden death immediately after labour seem to be due to the entrance of air into the veins. Six examples are cited by McClintock which were probably due to this cause. La Chapelle relates two. An interesting case is related by M. Lionet.[2] In this the patient died five and a half hours after an easy and natural labour, the chief

[1] *Union Médic.* 1853.   [2] Dehous, *op. cit.* p. 58.

symptoms being extreme pallor, efforts at vomiting, and dyspnœa. Air was found in the heart and in the arachnoid veins. There can be no question that the uterine sinuses after delivery are nearly as well adapted as the veins of the neck for allowing the entrance of air. They are firmly attached to the muscular walls of the uterus, so that they gape open when that organ is relaxed, and it is easy to understand how air might enter. Indeed, in the post-mortem examination in one of the cases occurring in the practice of Mme. La Chapelle, it is stated that 'the uterine sinuses opened in the interior of the uterus by large orifices (one line and a half in diameter), through which air could readily be blown as far as the iliac veins, and *vice versâ.*' The condition of the uterus after delivery also enables the air to have ready access to the mouths of the sinuses, for the alternate relaxation and contraction of the uterus, occurring after the placenta is expelled, would tend to draw in the air as by a suction-pump. Hence an additional reason for insisting on firm contraction of the uterus, as this will lessen the risk of this accident.

The precise mechanism of death from air in the veins has been a subject of dispute among pathologists. By Bichat[1] it was referred to anæmia and syncope from want of blood in the vessels of the brain, which are occupied by air. Nysten[2] attributed it to distension of the cavities of the heart by rarefied air, producing paralysis of its wall; Leroy to a stoppage of the pulmonary circulation, and consequent want of proper blood-supply to the left heart; while Leroy d'Etoilles thought it might depend on any of these causes, or a combination of all of them. These, and many other hypotheses on the subject, have been advanced, to all of which serious objection could be raised. The most recent theory is one maintained by Virchow, and Oppolzer,[3] and more recently by Feltz, which attributes the fatal results to impaction of the air-globules in the lesser divisions of the pulmonary arteries, where they form gaseous emboli, and cause death exactly in the same way as when the obstruction depends on a fibrinous

Cause of death in such cases.

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[1] *Recherches sur la Vie et la Mort,* 1853.

[2] Nysten, *Recherches de Phys. et Chim. Path.* 1811.

[3] *Casuistics des Embolies; Wiener Med. Woch.* 1862. *Des Embolies Capillaires,* 1868, and *op. cit.* p. 115.

embolus. The symptoms observed in fatal cases closely correspond to those of pulmonary obstruction, and it is not unlikely that some cases, attributed to other causes, may really depend on the entrance of air through the uterine sinuses. Such, for example, was most probably the explanation of a case referred to by Dr. Graily Hewitt in a discussion at the Obstetrical Society.[1] Death occurred shortly after the removal of an adherent placenta, during which, no doubt, air could readily enter the uterine cavity. The symptoms, viz., ' severe pain in the cardiac region, distress as regards respiration, and pulselessness,' are identical with those of pulmonary obstruction. Dr. Hewitt refers the death to shock, which certainly does not generally produce such phenomena.

[1] *Obstet. Trans.* vol. x. p. 28.

CHAPTER IX.

PERIPHERAL VENOUS THROMBOSIS—(SYN. : CRURAL PHLEBITIS—
PHLEGMASIA DOLENS—ANASARCA SEROSA—ŒDEMA LACTEUM
—WHITE LEG, ETC.)

We now come to discuss the symptoms and pathology of the Peripheral thrombosis. conditions associated with the formation of thrombi in the peripheral venous system, or rather in the veins of the lower extremities, since too little is known of their occurrence in other parts to enable us to say anything on the subject.

The most important of these is the well-known disease which, under the name *phlegmasia dolens*, has attracted much attention, and given rise to numerous theories as to its nature and pathology. In describing it as a local mani-festation of a general blood-dyscrasia, and not as an essential local disease, I am making an assumption as to its pathology that many eminent authorities would not consider justifiable. I have, however, already stated some of the reasons for so doing, and I shall shortly hope to show that this view is not incompatible with the most probable explanation of the peculiar state of the affected limb.

The first symptom which usually attracts attention is Symptoms. severe pain in some part of the limb that is about to be affected. The character of the pain varies in different cases. In some it is extremely acute, and is most felt in the neigh-bourhood of and along the course of the chief venous trunks. It may begin in the groin or hip and extend downwards ; or it may commence in the calf and proceed upwards towards the pelvis. The pain abates somewhat after swelling of the limb (which generally begins within twenty-four hours), but it is always a distressing symptom, and continues as long as the acute stage of the disease lasts. The restlessness, want of sleep, and suffering which it produces are sometimes

excessive. Coincident with the pain, and sometimes preceding it, more or less *malaise* is experienced. The patient may for a day or two be restless, irritable, and out of sorts, without any very definite cause ; or the disease may be ushered in by a distinct rigor. Generally there is constitutional disturbance, varying with the intensity of the case. The pulse is rapid and weak, 120 or thereabouts ; the temperature elevated from 101° to 102°, with an evening exacerbation. The patient is thirsty ; the tongue is glazed, or white and loaded ; the bowels constipated. In some few cases, when the local affection is slight, none of these constitutional symptoms are observed.

Condition of the affected limb.

The characteristic swelling rapidly follows the commencement of the symptoms. It generally begins in the groin, whence it extends downward. It may be limited to the thigh ; or the whole limb, even to the feet, may be implicated. More rarely it commences in the calf of the leg, extending upwards to the thigh, and downwards to the feet. The affected parts have a peculiar appearance, which is pathognomonic of the disease. They are hard, tense, and brawny ; of a shiny, white colour; and not yielding on pressure, except towards the beginning and end of the illness. The appearances presented are quite different from those of ordinary œdema. When the whole thigh is affected the limb is enormously increased in size. Frequently the venous trunks, especially the femoral and popliteal veins, are felt obstructed with coagula, and rolling under the finger. They are painful when handled, and in their course more or less redness is occasionally observed. Either leg may be attacked, but the left more frequently than the right. There is a marked tendency for the disease to spread, and we often find, in a case which is progressing apparently well, a rise of temperature and an accession of febrile symptoms followed by the swelling of the other limb.

Progress of the disease.

After the acute stage has lasted from a week to a fortnight the constitutional disturbance becomes less marked, the pulse and temperature fall, the pain abates, and the sleeplessness and restlessness are less. The swelling and tension of the limb now begin to diminish, and absorption commences. This is invariably a slow process. It is always many weeks before the effusion has disappeared, and it may be many

months. The limb retains for a length of time the peculiar _wooden_ feeling, as Dr. Churchill terms it. Any imprudence, such as a too early attempt at walking, may bring on a relapse and fresh swelling of the limb. This gradual recovery is by far the most common termination of the disease. In some rare cases suppuration may take place, either in the subcutaneous cellular tissue, the lymphatic glands, or even in the joints, and death may result from exhaustion. The possibility of pulmonary obstruction and sudden death from separation of an embolus have already been pointed out, and the fact that this lamentable occurrence has generally followed some undue exertion should be borne in mind, as a guide in the management of our patient.

Period of commencement.

The disease usually begins within a short time after delivery, rarely before the second week. In 22 cases tabulated by Dr. Robert Lee 7 were attacked between the fourth and twelfth days, and 14 after the second week. Some cases have been described as commencing even months after delivery. It is questionable if these can be classed as puerperal, for it must not be forgotten that phlegmasia dolens is by no means necessarily a puerperal disease. There are many other conditions which may give rise to it, all of them, however, such as produce a septic and hyperinosed state of the blood, such as malignant disease, dysentery, phthisis, and the like. My own experience would lead me to think that cases of this kind are much more common than is generally believed.

History and pathology.

The disease has long attracted the attention of the profession. Passing over more or less obscure notices by Hippocrates, De Castro, and others, we find the first clear account in the writings of Mauriceau, who not only gave a very accurate description of its symptoms, but made a guess at its pathology, which was certainly more happy than the speculations of his successors; it is, he says, caused 'by a reflux on the parts of certain humours which ought to have been evacuated by the lochia.' Puzos ascribed it to the arrest of the secretion of milk, and its extravasation in the affected limb. This theory, adopted by Levret and many subsequent writers, took a strong hold on both professional and public opinion, and to it we owe many of the names by which the disease is known to this day, such as œdema lac-

Theory of Puzos.

teum, milk leg, &c. In 1784 Mr. White, of Manchester, attributed it to some morbid condition of the lymphatic glands and vessels of the affected parts; and this, or some analogous theory, such as that of rupture of the lymphatics crossing the pelvic brim, as maintained by Tyre, of Gloucester, or general inflammation of the absorbents, as held by Dr. Ferrier, was generally adopted.

Phlebitic theory.

It was not until the year 1823 that attention was drawn to the condition of the veins. To Bouillaud belongs the undoubted merit of first pointing out that the veins of the affected limb were blocked up by coagula, although the fact had been previously observed by Dr. Davis, of University College. Dr. Davis made dissections of the veins in a fatal case, and found, as Bouillaud had done, that they were filled with coagula, which he assumed to be the results of inflammation of their coats; hence the name of 'crural phlebitis,' which has been extensively adopted, instead of phelgmasia dolens. Dr. Robert Lee did much to favour this view; and finding that thrombi were present in the iliac and uterine, as well as in the femoral, veins, he concluded that the phlebitis commenced in the uterine branches of the hypogastric veins, and extended downwards to the femorals. He pointed out that phlegmasia dolens was not limited to the puerperal state; but that when it did occur independently of it, other causes of uterine phlebitis were present, such as cancer of the os and cervix uteri. The inflammatory theory was pretty generally received, and even now is considered by many to be a sufficient explanation of the disease. Indeed, the fact that more or less thrombosis was always present could not be denied; and on the supposition that thrombosis could only be caused by phlebitis, as was long supposed to be the case, the inflammatory theory was the natural one. Before long, however, pathologists pointed out that thrombosis was by no means necessarily, or even generally, the result of inflammation of the vessels in which the clot was contained, but that the inflammation was more generally the result of the coagulum.

Theory of its dependence on septic causes.

The late Dr. Mackenzie took a prominent part in opposing the phlebitic theory. He proved, by numerous experiments on the lower animals, that inflammation is not sufficient of itself to produce the extensive thrombi which are found to

exist, and that inflammation originating in one part of a vein is not apt to spread along its canal, as the phlebitic theory assumes. His conclusion is that the origin of the disease is rather to be sought in some septic or altered condition of the blood, producing coagulation in the veins. Dr. Tyler Smith [1] pointed out an occasional analogy between the causes of phlegmasia dolens and puerperal fever, evidently recognising the dependence of the former on blood-dyscrasia. ' I believe,' he says, ' that contagion and infection play a very important part in the production of the disease. I look on a woman attacked with phlegmasia dolens as having made a fortunate escape from the greater dangers of diffuse phlebitis or puerperal fever.' In illustration of this he narrates the following instructive history :—' A short time ago a friend of mine had been in close attendance on a patient dying of erysipelatous sore-throat with sloughing, and was himself affected with sore-throat. Under these circumstances, he attended, within the space of twenty-four hours, three ladies in their confinements, all of whom were attacked with phlegmasia dolens.'

The latest important contribution to the pathology of the disease is contained in two papers by Dr. Tilbury Fox, published in the second volume of the ' Obstetrical Transactions.' He maintained that something beyond the mere presence of coagula in the veins is required to produce the phenomena of the disease, although he admitted that to be an important, and even an essential, part of the pathological changes present. The thrombi he believed to be produced either by extrinsic or intrinsic causes : the former comprising all cases of pressure by tumour or the like ; the latter, and the most important, being divisible into the heads of—

View of Tilbury Fox.

1. True-inflammatory changes in the vessels, as seen in the epidemic form of the disease.

2. Simple thrombus, produced by rapid absorption of morbid fluid.

3. Virus action and thrombus conjoined, the phlegmasia dolens itself being the result of simple thrombus, and not produced by diseased (inflamed) coats of vessels ; the general symptoms the result of the general blood-state.

He further pointed out that the peculiar swelling of the

[1] Tyler Smith, *Manual of Obstetrics*, p. 538.

limbs cannot be explained by the mere presence of œdema, from which it is essentially different ; the white appearance of the skin, the severe neuralgic pain, and the persistent numbness indicating that the whole of the cutaneous textures, the cutis vera and even the epithelial layer, are infiltrated with fibrinous deposit. He concluded, therefore, that the swelling is the result of œdema *plus* something else ; that something being obstruction of the lymphatics, by which the absorption of effused serum is prevented. The efficient cause which produces these changes he believes to be, in the majority of cases, a septic action originating in the uterus, producing a condition similar to that in which phlegmasia dolens arises in the non-puerperal state.

There is no doubt much force in Dr. Fox's arguments, and it may, I think, be conceded that obstruction of the veins *per se* is not sufficient to produce the peculiar appearance of the limb. It is, moreover, certain that phlebitis alone is also an insufficient explanation not only of the symptoms, but even of the presence of thrombi so extensive as those that are found. The view which traces the disease solely to inflammation or obstruction of lymphatics is purely theoretical, has no basis of facts to support it, and finds, nowadays, no supporters. The experiments of Mackenzie and Lee, as well as the vastly increased knowledge of the causes of thrombosis which the researches of modern pathologists have given us, seem to point strongly to the view already stated, that the disease can only be explained by a general blood-dyscrasia, depending on the puerperal state. It by no means follows that we are to consider Dr. Fox's speculations as incorrect. It is far from improbable that the lymphatic vessels are implicated in the production of the peculiar swelling, only we are not as yet in a position to prove it. There is no inherent improbability in the supposition that the same morbid state of the blood which produces thrombosis in the veins may also give rise to such an amount of irritation in the lymphatics as may interfere with their functions, and even obstruct them altogether. The essential and all-important point in the pathology of the disease, however, seems undoubtedly to be thrombosis in the veins ; and the probability of there being some as yet undetermined pathological changes in addition to this, by no means militates

against the view I have taken of the intimate connection of the disease with other results of thrombosis in different vessels.

The changes which take place in the thrombi all tend to their ultimate absorption. These have been described by various authors as leading to organisation or suppuration. It is probable, however, that the appearances which have led to such a supposition are fallacious, and that they are really due to retrograde metamorphosis of the fibrine, generally of an amylaceous or fatty character.

<div style="float:right">Changes occurring in the thrombi.</div>

The peculiarities of a clot that most favour detachment of an embolus are such a shape as admits of a portion floating freely in the blood-current by the force of which it is detached and carried to its ultimate destination. When the accident has occurred it is often possible to recognise the peripheral thrombus from which the embolus has separated, by the fact of its terminal extremity presenting a fleshy fractured end, instead of the rounded head natural to it. Such detachment is unlikely to occur, even when favoured by the shape of the clot, unless sufficient time have elapsed after its formation to admit of its softening and becoming brittle. The curious fact I have before mentioned, of true puerperal embolism occurring in the large majority of cases only after the nineteenth day from delivery, finds a ready explanation in this theory which it remarkably corroborates.

<div style="float:right">Detachment of emboli.</div>

On the supposition that phlegmasia dolens was the result of inflammation of the veins of the affected limb, an antiphlogistic course of treatment was naturally adopted. Accordingly, most writers on the subject recommended depletion, generally by the application of leeches, along the course of the affected vessels. We are told that if the pain continue the leeches should be applied a second or even a third time. If we admit the septic origin of the disease, we must, I think, see the impropriety of such a practice. The fact that it occurs, in a large majority of cases, in patients of a weakly and debilitated constitution, often in women who have suffered from hæmorrhage, is a further reason for not adopting this routine custom. If local loss of blood be used at all, it should be strictly limited to cases in which there is much tenderness and redness across the course of the veins, and

<div style="float:right">Treatment.</div>

then only in patients of plethoric habits and strong constitution. Cases of this kind will form a very small minority of those coming under our observation.

Over-active treatment unadvisable. What has been said of the pathology of the affection tends to the conclusion that active treatment of any kind, in the hope of curing the disease, is likely to be useless. Our chief reliance must be on time and perfect rest in order to admit of the thrombi and the secondary effusion being absorbed; while we relieve the pain and other prominent symptoms, and support the strength and improve the constitution of the patient.

Relief of pain, &c. The constant application of heat and moisture to the affected limb will do much to lessen the tension and pain. Wrapping the entire limb in linseed-meal poultices, frequently changed, is one of the best means of meeting this indication. If, as is sometimes the case, the weight of the poultices be too great to be readily borne, we may substitute warm flannel stupes, covered with oiled silk. Local anodyne applications afford much relief, and may be advantageously used along with the poultices and stupes, either by sprinkling their surface freely with laudanum or chloroform and belladonna liniment, or by soaking the flannels in poppy-head fomentations. It is needless to say that the most absolute rest in bed should be enjoined, even in slight cases, and that the limb should be effectually guarded from undue pressure by a cradle or some similar contrivance. Local counter-irritation has been strongly recommended, and frequent blisters have been considered by some to be almost specific. I should myself hesitate to use blisters, as they would certainly not be soothing applications, and one hardly sees how they can be of much service in hastening the absorption of the effusion.

Constitutional treatment. During the acute stage of the disease the constitutional treatment must be regulated by the condition of the patient. Light but nutritious diet must be administered in abundance, such as milk, beef-tea, and soups. Should there be much debility, stimulants, in moderation, may prove of service. With regard to medicines we shall probably find benefit from such as are calculated to improve the condition of the blood and the general health of the patient. Chlorate of potash, with diluted hydrochloric acid, quinine, either alone or in combination with sesquicarbonate of ammonia,

the tincture of the perchloride of iron, are the drugs that are most likely to prove of service. Alkalies and other medicines, which have been recommended in the hope of hastening the absorption of coagula, must be considered as altogether useless. Pain must be relieved and sleep procured by the judicious use of anodynes, such as Dover's powder, the subcutaneous injection of morphia, or chloral. Generally no form answers so well as the hypodermic injection of morphia.

When the acute symptoms have abated, and the temperature has fallen, the poultices and stupes may be discontinued, and the limbs swathed in a flannel roller from the toes upwards. The equable pressure and support thus afforded materially aid the absorption of the effusion, and tend to diminish the size of the limb. At a still later stage very gentle inunctions of weak iodine ointment may be used with advantage once a day before the roller is applied. Shampooing and friction of the limb, generally recommended for the purpose of hastening absorption, should be carefully avoided, on account of the possible risk of detaching a portion of the coagulum and producing embolism. This is no merely imaginary danger, as the following fact narrated by Trousseau proves:—' A phlegmasia alba dolens had appeared on the left side in a young woman suffering from peri-uterine phlegmon. The pain having ceased, a thickened venous trunk was felt on the upper and internal part of the thigh. Rather strong pressure was being made, when M. Demarquay felt something yield under his fingers. A few minutes afterwards the patient was attacked with dreadful palpitation, tumultuous cardiac action, and extreme pallor, and death was believed to be imminent. After some hours, however, the oppression ceased, and the patient eventually recovered. A slightly attached coagulum must have become separated, and conveyed to the heart or pulmonary artery.' [1] Warm douches of water—of salt water, if it can be obtained—may be advantageously used in the later stages of the disease, and they may be applied night and morning, the limb being bandaged in the interval. The occasional use of the electric current is said to promote absorption, and would seem likely to be a serviceable remedy.

Subsequent local treatment.

[1] Trousseau, *Clinique de l'Hôtel-Dieu*, in *Gaz. des Hôp.* 1860, p. 577.

Change of
air.
When the patient is well enough to be moved, a change of air to the sea-side will be of value. Great caution, however, should be recommended in using the limb, and it is far better not to run the risk of a relapse by any undue haste in this respect. It is well to warn the patient and her friends that a considerable time must of necessity elapse before the local signs of the disease have completely disappeared.

CHAPTER X.

PELVIC CELLULITIS AND PELVIC PERITONITIS.

FROM the earliest time the occurrence after parturition of severe forms of inflammatory disease in and about the pelvis, frequently ending in suppuration, has been well known. It is only of late years, however, that these diseases have been made the subject of accurate clinical and pathological investigation, and that their true nature has begun to be understood. Nor is our knowledge of them as yet by any means complete. They merit careful study on the part of the accoucheur, for they give rise to some of the most severe and protracted illnesses from which puerperal patients suffer. They are often obscure in their origin and apt to be overlooked, and they not rarely leave behind them lasting mischief. *These diseases have been recognised from the earliest times.*

These diseases are not limited to the puerperal state. On the contrary, many of the severest cases arise from causes altogether unconnected with child-bearing. These will not be now considered, and this chapter deals solely with such forms as may be directly traced to childbirth. *They are not limited to the puerperal state.*

Modern researches have demonstrated that there are two distinct varieties of inflammatory disease met with after labour, which differ materially from each other in many respects. In one of these the inflammation affects chiefly the connective tissue surrounding the generative organs contained within the pelvis, or extends up from beneath the peritoneum, and into the iliac fossæ. In the other it attacks that portion of the peritoneum which covers the pelvic viscera, and is limited to it. *Two distinct forms of inflammatory disease are met with.*

So much is admitted by all writers; but great obscurity in description, and consequent difficulty in understanding satisfactorily the nature of these affections, have resulted from *Variety of nomenclature which has been adopted.*

the variety of nomenclature which different authors have adopted.

Thus the former disease has been variously described as pelvic cellulitis, peri-uterine phlegmon, para-metritis, or pelvic abscess ; while the latter is not unfrequently called peri-metritis, as contradistinguished from para-metritis. The use of the prefix *para* or *peri*, to distinguish the cellular or peritoneal variety of inflammation, originally suggested by Virchow, has been pretty generally adopted in Germany, and has been strongly advocated in this country by Matthews Duncan. It has never, however, found much favour with English writers, and the similarity of the two names is so great as to lead to confusion. I have, therefore, selected the terms '*pelvic peritonitis*' and '*pelvic cellulitis*,' as conveying in themselves a fairly accurate notion of the tissues mainly involved.

Import-
ance of
distin-
guishing
the two
classes of
cases.

The important fact to remember is that there exist two distinct varieties of inflammatory disease, presenting many similarities in their course, symptoms, and results, often occurring simultaneously, but in the main distinct in their pathology, and capable of being differentiated. Thomas compares them—and, as serving to fix the facts on the memory, the illustration is a good one—to pleurisy and pneumonia. ' Like them,' he says, ' they are separate and distinct, like them affect different kinds of structure, and like them they generally complicate each other.' It might, therefore, be advisable, as most writers on the disease occurring in the non-puerperal state have done, to treat of them in two separate chapters. There is, however, more difficulty in distinguishing them as puerperal than as non-puerperal affections, for which reason, as well as for the sake of brevity, I think it better to consider them together, pointing out, as I proceed, the distinctive peculiarities of each.

Seat of
disease.

When attention was first directed to this class of diseases the pelvic cellular tissue was believed to be the only structure affected. This was the view maintained by Nonat, Simpson, and many modern writers. Attention was first prominently directed to the importance of localised inflammation of the peritoneum, and to the fact that many of the supposed cases of cellulitis were really peritonitic, by Bernutz. There can be no doubt that he here made an enormous step in advance.

Like many authors, however, he rode his hobby a little too hard, and he erred in denying the occurrence of cellulitis in many cases in which it undoubtedly exists.

The great influence of childbirth in producing these diseases has long been fully recognised. Courty estimates that about two-thirds of all the cases met with occur in connection with delivery or abortion, and Duncan found that out of 40 carefully observed cases 25 were associated with the puerperal state.

It is pretty generally admitted by most modern writers that both varieties of the disease are produced by the extension of inflammation from either the uterus, the Fallopian tubes, or the ovaries. This point has been especially insisted on by Duncan, who maintains that the disease is never idiopathic, and is 'invariably secondary either to mechanical injury, or to the extension of inflammation of some of the pelvic viscera, or to the irritation of the noxious discharges through or from the tubes or ovaries.'

Their intimate connection with puerperal septicæmia is also a prominent fact in the natural history of the diseases. Barker mentions a curious observation illustrative of this, that when puerperal fever is endemic in the Bellevue Hospital, in New York, cases of pelvic peritonitis and cellulitis are also invariably met with. Olshausen has also remarked that in the Lying-in Hospital at Halle, during the autumn vacation, when the patients are not attended by practitioners, and when, therefore, the chance of septic infection being conveyed to them is less, these inflammations are almost always absent. As inflammation of the lining membrane of the uterus, of the vaginal mucous membrane, and of the pelvic connective tissue, are of very constant occurrence as local phenomena of septic absorption, the connection between the two classes of cases is readily susceptible of explanation. Schroeder, indeed, goes further, and includes his description of these diseases under the head of puerperal fever. They do not, however, necessarily depend upon it; for, although it must be admitted that cases of this kind form a large proportion of those met with, others unquestionably occur which cannot be traced to such sources, but are the direct result of causes altogether unconnected with the inflammation attending on septic absorption, such as undue exertion shortly after

delivery, or premature coition. Mechanical causes may beyond doubt excite the disease in a woman predisposed by the puerperal process, but they cannot fairly be included under the head of puerperal fever.

Seat of the inflammation in pelvic cellulitis.

Abundance of areolar tissue exists in connection with the pelvic viscera, which may be the seat of cellulitis. It forms a loose padding between the organs contained in the pelvis proper, surrounds the vagina, the rectum, and the bladder, and is found in considerable quantity between the folds of the broad ligaments. From these parts it extends upwards to the iliac fossæ and the inner surface of the abdominal parietes. In any of these positions it may be the seat of the kind of inflammation we are discussing. The essential character of the inflammation is similar to that which accompanies areolar inflammation in other parts of the body. There is first an acute inflammatory œdema, followed by the infiltration of the areolæ of the connective tissue with exudation, and the consequent formation of appreciable swellings. These may form in any part of the pelvis. Thus we may meet with them—and this is a very common situation—between the folds of the broad ligaments, forming distinct hard tumours, connected with the uterus, and extending to the pelvic walls, their rounded outlines being readily made out by bi-manual examination. If the cellulitis be limited in extent, such a swelling may exist on one side of the uterus only, forming a rounded mass of varying size, and apparently attached to it. At other times the exudation is more extensive, and may completely or partially surround the uterus, extending to the cellular tissue between the vagina and rectum, or between the uterus and the bladder. In such cases the uterus is embedded and firmly fixed in dense hard exudation. At other times the inflammation chiefly affects the cellular tissue covering the muscles lining the iliac fossæ. There it forms a mass, easily made out by palpation, but on vaginal examination little or no trace of the exudation can be felt, or only a sense of thickness at the roof of the vagina on the same side as the swelling.

Seat of the inflammation in pelvic peritonitis.

In pelvic peritonitis the inflammation is limited to that portion of the peritoneum which invests the pelvic viscera. Its extent necessarily varies with the intensity and duration of the attack. In some cases there may be little more than

irritation, while more often it runs on to exudation of plastic material. The result is generally complete fixation of the uterus, and hardening and swelling in the roof of the vagina, and the lymph poured out may mat together the surrounding viscera, so as to form swellings, difficult, in some cases, to differentiate from those resulting from cellulitis. On post-mortem examination the pelvic viscera are found extensively adherent, and the agglutination may involve the coils of the intestine in the vicinity, so as sometimes to form tumours of considerable size.

The relative frequency of these two forms of inflamma- Relative tion as puerperal affections is not easy to ascertain. In the frequency of the two non-puerperal state the peritonitic variety is much the more forms of common, but in the puerperal state they very generally com- disease. plicate each other, and it is rare for cellulitis to exist to any great extent without more or less peritonitis.

The earliest symptom is pain in the lower part of the Sympto- abdomen, which is generally preceded by rigor or chilliness. matology. The amount of pain varies much. Sometimes it is com- paratively slight, and it is by no means rare to meet with patients, who are the subjects of very considerable exudations, who suffer little more than a certain sense of weight and discomfort at the lower part of the abdomen. On the other hand, the suffering may be excessive, and is characterised by paroxysmal exacerbations, the patient being comparatively free from pain for several successive hours, and then having attacks of the most acute agony. Schroeder says that pain Pain is is always a symptom of peritonitis, and that it does not exist probably sympto- in uncomplicated cellulitis. The swellings of cellulitis are matic of certainly sometimes remarkably free from tenderness, and I peritoneal complica- have often seen masses of exudation in the iliac fossæ which tion. could bear even rough handling. On the other hand, although this is certainly more often met with in non- puerperal cases, the tenderness over the abdomen is sometimes excessive, the patient shrinking from the slightest touch. The pulse is raised, generally from 100 to 120, and the ther- mometer shows the presence of pyrexia. During the entire course of the disease both these symptoms continue. The temperature is often very high, but more frequently it varies from 100° to 104°, and it generally shows more or less marked remissions. In some cases the temperature is said not to be

elevated at all, or even to be sub-normal, but this is certainly quite exceptional. Other signs of local and general irritation often exist. Among them, and most distinctly in cases of peritonitis, are nausea and vomiting, and an anxious, pinched expression of the countenance, while the local mischief often causes distressing dysuria and tenesmus. The latter is especially apt to occur when there is exudation between the rectum and vagina, which presses on the bowel. The passage of fæces, unless in a very liquid form, may then cause intolerable suffering.

The symptoms are often insidious in their onset.

Such symptoms may show themselves within a few days after delivery, and then they can barely fail to attract attention. On the other hand, they may not commence for some weeks after labour, and then they are often insidious in their onset, and apt to be overlooked. It is far from rare to meet with cases six weeks or more after confinement, in which the patient complains of little beyond a feeling of *malaise* and discomfort, and in which, on investigation, a considerable amount of exudation is detected, which had previously entirely escaped observation.

Results of physical examination.

On introducing the finger into the vagina it will be found to be hot and swollen, in some cases distinctly œdematous, and on reaching the vaginal *cul de sac* the existence of exudation may generally be made out. The amount of this varies much. Sometimes, especially in the early stage of the disease, there is little more than a diffuse sense of thickness and induration at either side of, or behind, the uterus. More generally, careful bi-manual examination enables us to detect a distinct hardening and swelling, possibly a tumour of considerable size, which may apparently be attached to the sides of the uterus, and rise above the pelvic brim, or may extend quite to the pelvic walls. The examination should be very carefully and systematically conducted with both hands, so as to explore the whole contour of the uterus before, behind, and on either side, as well as the iliac fossæ; otherwise a considerable exudation might readily escape detection. When the exudation is at all great, more or less fixity of the uterus is sure to exist, and is a very characteristic symptom.

The womb is generally fixed and often displaced.

The womb, instead of being freely movable by the examining finger, is firmly fixed by the surrounding exudation, and in severe forms of the disease is quite encased in it. More

or less displacement of the organ is also of common occurrence. If the swelling be limited to one side of the pelvis or to Douglas's space, the uterus is displaced in the opposite direction, so that it is no longer in its usual central position.

The differential diagnosis of pelvic cellulitis and pelvic peritonitis cannot always be made, and indeed in many cases it is impossible, since both varieties of disease coexist. The elements of differentiation generally insisted on are, the greater general disturbance, nausea, &c., in pelvic peritonitis, with an earlier commencement of the symptoms after labour. The swellings of pelvic peritonitis are also more tender, with less clearly defined outline than those of cellulitis. When the cellulitis involves the iliac fossa the diagnosis is, of course, easy, and then a continuous retraction of the thigh on the affected side (an involuntary position assumed with the view of keeping the muscles lining the iliac fossa at rest) is often observed. When the inflammation is chiefly limited to the cavity of the pelvis, the distinction between the two classes of cases cannot be made with any degree of certainty.

The two forms of disease cannot always be distinguished.

Both forms of disease may end either in resolution or in suppuration. In the former case, after the acute symptoms have existed for a variable time, it may be for a few days only, it may be for many weeks, their severity abates, the swellings become less tender and commence to contract, become harder, and are gradually absorbed; until, at last, the fixity of the uterus disappears, and it again resumes its central position in the pelvic cavity. This process is often very gradual. It is by no means rare to find a patient, even some months after the attack, when all acute symptoms have long disappeared, who is even able to move about without inconvenience, in whom the uterus is still immovably fixed in a mass of deposit, or is at least adherent in some part of its contour. More or less permanent adhesions are of common occurrence, and give rise to symptoms of considerable obscurity, which are often not traced to their proper source.

Terminations.

When the inflammation is about to terminate in suppuration, the pyrexial symptoms continue, and eventually well-marked hectic is developed, the temperature generally showing a distinct exacerbation at night. At the same time rigors, loss of appetite, a peculiar yellowish discoloration of the face, and other signs of suppuration, show themselves.

Symptoms of suppuration.

The relative frequency of this termination is variously esti-
mated by authors. Duncan quotes Simpson as calculating
it as occurring in half the cases of pelvic cellulitis, but
states his own belief that it is much more frequent. West
observed it in 23 out of 43 cases following delivery or abor-
tion, and McClintock in 37 out of 70. Schroeder says that
he has only once seen suppuration in 92 cases of distinctly
demonstrable exudation, a result which is certainly totally
opposed to common experience. Barker also states that
in his experience suppuration in either pelvic peritonitis
or cellulitis 'is very rare, except when they are associated
with pyæmia or puerperal fever.' It is certain that suppura-
tion is more likely to occur in pelvic cellulitis than in pelvic
peritonitis, but it unquestionably occurs, in this country at
least, much more frequently than the statements of either of
these authors would lead us to suppose.

Channels
through
which
pus may
escape.

The pus may find an exit through various channels. In
pelvic cellulitis, more especially when the areolar tissue of
the iliac fossa is implicated, the most common site of exit
is through the abdominal wall. It may, however, open at
other positions, and the pus may find its way through the
cellular tissue and point at the side of the anus or in the
vagina, or it may take even a more tortuous course and
reach the inner surface of the thigh. Pelvic abscesses not
uncommonly open into the rectum or bladder, causing very
considerable distress from tenesmus or dysuria. According
to Hervieux it is chiefly the peritoneal varieties which open
in this way. Not unfrequently more than one opening is
formed; and when the pus has burrowed for any distance
long fistulous tracts result, which secrete pus for a length of
time, and are very slow to heal. Rupture of an abscess into
the peritoneal cavity, especially of a peritonitic abscess, is a
possible (but fortunately a very rare) termination, and will
generally prove fatal by producing general peritonitis. In
one case which I have recorded, in the fifteenth volume of
the 'Obstetrical Transactions,' suppuration was followed by
extensive necrosis of the pelvic bones. Two similar cases are
related by Trousseau in his ' Clinical Medicine,' but I have not
been able to meet with any other examples of this rare com-
plication, which was probably rather the result of some obscure
septicæmic condition than of extension of the inflammation.

The prognosis is favourable as regards ultimate recovery, but there is a great risk of a protracted illness which may seriously impair the health of the patient, especially if suppuration result. Hence it is necessary to be guarded in an expression of opinion as to the consequences of the disease. Secondary mischief is also far from unlikely to follow, from the physical changes produced by the exudation, such as permanent adhesions or malpositions of the uterus, or organic alterations in the ovaries or Fallopian tubes.

In the treatment of both forms of disease the important points to bear in mind are the relief of pain and the necessity of absolute rest; and to these objects all our measures must be subordinate, since it is quite hopeless to attempt to cut short the inflammation by any active medication.

If the disease be recognised at a very early stage, the local abstraction of blood, by the application of a few leeches to the groin or to the hæmorrhoidal veins, may give relief; but the influence of this remedy has been greatly exaggerated, and when the disease is of any standing it is quite useless. Leeches to the uterus, often recommended, are, I believe, likely to do more harm than good (unless in very skilful hands), from the irritation produced by passing the speculum. Opiates in large doses may be said to be our sheet-anchor in treatment whenever the pain is at all severe, either by the mouth, in the form of morphia suppositories, or injected subcutaneously. In the not uncommon cases in which pain comes on severely in paroxysms, the opiates should be administered in sufficient quantity to lull the pain; and it is a good plan to give the nurse a supply of morphia suppositories (which often act better than any other form of administering the drug), with directions to use them immediately the pain threatens to come on. When there is much pyrexia large doses of quinine may be given with great advantage, along with the opiates. The state of the bowels requires careful attention. The opiates are apt to produce constipation, and the passage of hardened fæces causes much suffering. Hence it is desirable to keep the bowels freely open. Nothing answers this purpose so well as small doses of castor-oil, such as half a teaspoonful given every morning. Warmth and moisture, constantly applied to the lower part of the abdomen,

Warmth and moisture.

give great relief, either in the form of large poultices of linseed-meal, or, if these prove too heavy, of spongio-piline soaked in boiling water. The poultices may be advantageously sprinkled with laudanum or belladonna liniment. I say nothing of the use of mercurials, iodide of potassium, and other so-called absorbent remedies, since I believe them to be quite valueless, and apt to divert attention from more useful plans of treatment.

Importance of rest.

The most absolute rest in the recumbent position is essential, and it should be persevered in for some time after the intensity of the symptoms is lessened. The beneficial effect of rest in alleviating pain is often seen in neglected cases, the nature of which has been overlooked, instant relief following the laying up of the patient.

Counter-irritation.

When the acute symptoms have lessened, absorption of the exudation may be favoured, and considerable relief obtained, from counter-irritation, which should be gentle and long-continued. The daily use of tincture of iodine until the skin peels, perhaps best meets this indication; but frequently repeated blisters are often very serviceable. This I believe to be a better plan than keeping up an open sore with savine ointment, or similar irritating applications.

Opening of pelvic abscesses.

When suppuration is established the question of opening the abscess arises. When this points in the groin, and the matter is superficial, a free incision may be made, and here, as in mammary abscess, the antiseptic treatment is likely to prove very serviceable. The abscess should, however, not be opened too soon, and it is better to wait until the pus is near the surface. The importance of not being in too great a hurry to open pelvic abscesses has been insisted on by West, Duncan, and other writers, and I have no doubt the rule is a good one. It is more especially applicable when the abscess is pointing in the vagina or rectum, where exploratory incisions are apt to be dangerous, and when the presence of pus should be positively ascertained before operating. We have in the aspirator a most useful instrument in the treatment of such cases, which enables us to remove the greater part of the pus without any risk, and the use of which is not attended with danger, even if employed prematurely. If it do not sufficiently evacuate the abscess a free opening can afterwards be safely made with the bistoury. The surgical

treatment of pelvic abscess is, however, too wide a subject to admit of being satisfactorily treated here.

The diet should be abundant, but simple and nutritious. Diet and In the early stages of the disease milk, beef-tea, eggs, and regimen. the like will be sufficient. After suppuration a large quantity of animal food is necessary, and a sufficient amount of stimulants. The drain on the system is then often very great, and the amount of nourishment patients will require and assimilate, when a copious purulent discharge is going on, is often quite remarkable. A general tonic plan of medication is also indicated, and such drugs as iron, quinine, and cod-liver oil will prove useful.

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THE END.